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A Sociotechnical Systems Analysis of the Approval Process for a Complex Public Works Proposal

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A SOCIOTECHNICAL SYSTEMS ANALYSIS OF THE APPROVAL PROCESS FOR A COMPLEX PUBLIC WORKS PROPOSAL

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ABSTRACT

A SOCIOTECHNICAL SYSTEMS ANALYSIS OF
THE APPROVAL PROCESS FOR A COMPLEX
PUBLIC WORKS PROPOSAL

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This research applied sociotechnical systems theory to explore the process used by two elected bodies to decide upon adoption of a complex technical engineering proposal. The research used a modified sociotechnical systems conceptual framework that was developed by Pava (1983) for application to non-traditional work settings. Pava applied the conceptual framework to what he termed non-routine office work which is characterized by non-linear conversion flow, multiple, concurrent conversion processes and vocational separatism (Pava, 1983).

The research was designed as a multiple case study of two town councils each undertaking a decision process to approve or reject a public works proposal to join a metropolitan public utility. The proposal was submitted to the towns in the form of a technical engineering feasibility study which was distributed to the council members in each town. Qualitative data was collected in the form of field notes from meetings and telephone conversations, tape recordings of meetings, tape recordings of interviews, copies of official meeting minutes and newspaper articles.

A modified sociotechnical systems conceptual framework based on Pava (1983) was used to structure the data analysis and provide rigor to the case study method (Yin, 1994). The sociotechnical systems conceptual framework provided a theoretically based set of categories with which to draw evidence from the raw data and compile it into a case study data base. The case study

data base was then used as the source of emergent themes and issues for development of the case study narratives. The case study narratives were reviewed by selected participants for content and accuracy. Case study review comments were incorporated into the final drafts of the narratives.

A cross case analysis was performed on the two narratives. The research generated implications for applications of sociotechnical systems theory in non-traditional settings and the capability of sociotechnical systems as a conceptual framework for case study research. In addition implications were also developed for engineering practice in a political environment and for further research.

DEDICATION

This work is dedicated to my wife, Teresa, for her support, encouragement, love, and for being a model of ambition and determination; to my parents, who gave me guidance, let me choose my own road, and did not criticize me when I stumbled along the way; and to my children Christene and Michael for their help and support.

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CHAPTER I

INTRODUCTION AND ORGANIZATION

In the course of their work engineers are called upon to solve complicated problems. In many instances, especially in civil engineering, the solutions are developed in the form of large, complex projects or proposals that are then submitted to the private client or public body for approval. Oftentimes the proposals are submitted in the form of plans or feasibility study reports that are, by necessity, highly complex technical documents. Public bodies who must approve these proposals are normally comprised of elected officials who are not full time public administrators but common citizens. These citizens generally have no technical background. The public body exists in a political environment and is subject to many outside influences. The members of the public body must make decisions on these complex technical proposals within this political environment often without the technical background to fully understand the proposals before them. This study is an attempt to understand the process by which these decisions are made. It utilizes a powerful conceptual framework developed from sociotechnical systems. Sociotechnical systems has traditionally been used as an analysis and intervention tool for conventional, manufacturing oriented, organizations (Cummings, 1978). More recently, its use has been extended to office and management activities (Pava, 1983). This research

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The *Engineering Management Journal* was used as the model for reference format, placement of figure titles, and placement of table titles.

attempts to extend sociotechnical systems into a new area as a framework for analysis of a complex political decision process.

To preserve the anonymity of the individuals and localities, the names of the participants, agencies, governments, and their geographical references are excluded. This also resulted in the exclusion of certain references and citations.

Background

A large metropolitan public utility was asked by the localities in a rural region of the southeastern United States to determine the feasibility of the utility to provide wastewater collection and treatment service to the population centers in the region. The utility responded by assigning a senior engineering manager to establish an office in the rural region to perform the study.

The feasibility study was completed and approved by the metropolitan public utility's governance board in February 1996 . There were three primary recommendations of the study. First, it recommended forming a separate division within the utility to operate the existing treatment system in the rural region. Second, it recommended that the division be a financially separate cost center to maintain the localities' eligibility for grants and low interest loans that are only available to small communities. Finally, in order to maintain a level of local control, the study proposed the formation of a regional advisory board, comprised of representatives from each of the rural localities, to adopt the rural division's rates and budgets and to set priorities for capital improvements and expansions. Operating costs were estimated to remain low through the use of automation and electronic process monitoring, which would keep the need for

operating personnel to a minimum.

There were four counties and two towns in the rural region that seriously considered the proposal. (see Table 1) Only four of the localities had existing wastewater systems. These separate localities were relatively small and all of them had to elect to become a part of the rural division in order to establish a large enough customer base for the newly proposed division to be financially viable. The localities without systems could also join the division, but they would not have a vote on the regional advisory board until service was expanded into their areas.

The study presented an operating plan for the rural division which would be feasible from both an engineering and a financial standpoint . The final decision for each locality to join the metropolitan public utility and to form the rural division rested with the elected officials. The same decision was considered separately by six different political bodies. There were many issues these bodies had to consider. The issue of public opinion, concerning growth and local control, was different in each of the localities. There was also the matter of its being an election year for some of the elected officials. The issue regional cooperation verses independence has also been a continuing issue within the elected bodies and other regional organizations.

The research was built around a case study of two localities making the decision whether or not to join the metropolitan public utility in formation of the rural division. Each locality had been given the same information.

Locality	Political Subdivision	Has Existing Wastewater Facilities	Decision Status
Watertown	Town	Yes	Voted yes
Riverview	Town	Yes	Voted no
C	County	No	Voted yes
D	County	No	Not yet voted
E	County	No	Not yet voted
F	County	Yes	Not yet voted
G	Town	Yes	Not seriously considered

Table 1. Locality Decision Status

Purpose of the Study

The purpose of the study was to apply sociotechnical systems theory to explore the process used by two elected bodies to decide upon adoption of a complex technical engineering proposal. A case study approach was used.

Public works proposals, are normally introduced to an elected body for consideration in the form of technical reports and plans. In many cases the elected officials do not have the background to understand these proposals as they are submitted. They rely on the government staff and other experts to interpret the information for them and reduce it to a form they can assimilate. Once the information is in a form they can understand, the elected officials can deliberate on the various issues surrounding the proposals and reach a decision to accept or reject the proposals based on their understanding of the technical and financial implications for their locality. The government staff can then act on the decisions to dismiss the proposals, request revision to the proposals or adopt the proposals.

This proposal decision process was being investigated to gain a better understanding of technical decisions by non-technical bodies. In order to achieve this the transformation process from information to decision had to be understood. Through understanding the transformation process, it was possible to develop a greater understanding of the process used to consider a technical proposal. The research also provided a better understanding of what can be done during the preparation of technical proposals to make them more amenable to the decision process.

The study used sociotechnical systems theory and methods as a conceptual framework to investigate government based systems. Sociotechnical systems concepts were originally developed around mining and manufacturing systems (Fox, 1995). These systems were characterized by linear or sequential processes to transform raw materials into products. In this research sociotechnical systems methods were extended into systems that fall outside conventional applications due to their nonlinear transformation processes.

The sociotechnical systems conceptual framework was used as a data analysis method in a case study. Case study research has been consistently criticized for its lack of rigor and, therefore, not considered by some in the scientific community as a serious research method (Yin, 1994). Advocates of case study methods respond that the use of a theoretical framework for data analysis can provide the necessary rigor (Yin, 1994). The research adapted sociotechnical systems methods that were originally developed as part of an organizational intervention strategy for use as a data analysis method in case study research. This study is significant because the combination of sociotechnical systems with case study research has not been applied to analysis of nonlinear systems in the process of evaluating complex technical proposals. In addition, this research adds to the body of literature for sociotechnical systems application to non-linear systems in non-traditional settings.

Research Questions

There were two research questions this case study attempted to explore. The case study method was appropriate because it can deal with complex relationships among variables that may not be amenable to a quantitative method (Yin, 1994). The questions themselves dealt with the implications of the research for the utility of sociotechnical systems theory and methods for a broader range of systems and the practical uses of sociotechnical systems as a conceptual framework to conduct a case study. The questions also explore the implications the results have for engineers and other experts when working with elected officials on complex technical decisions. The study also considered questions concerning the use of sociotechnical systems as a research framework.

The first research question is: *Can a sociotechnical systems based conceptual framework be applied to explore the evaluation process of technical engineering proposals in a political setting?* The conceptual framework based on sociotechnical systems theory was applied to a nontraditional setting which used non-linear transformation processes. Although there have been a wide range of sociotechnical systems applications, this is the first time that a sociotechnical systems based conceptual framework has been used to explore the technical proposal evaluation process in a local political environment. The evaluation of technical proposals is a common event in most local governments. In this instance the sociotechnical systems based conceptual framework is used in a

descriptive role as an analysis method rather than in the conventional prescriptive role as in organizational design or redesign.

The second research question is: *What implications can be drawn from using sociotechnical systems theory to explore a complex process in a nontraditional setting ?* The response to this research question developed implications for the use of a sociotechnical systems conceptual framework for use as a technique for analysis of nonlinear systems in nontraditional domains.

In conventional settings, sociotechnical systems conceptual frameworks have been used as intervention strategy (Walton, 1978). This research developed implications for using the results of a sociotechnical systems based analysis of a political evaluation process for the practice of engineering management. These implications include concepts that can be applied to the formation of technical engineering proposals and their submission for evaluation

This study also explored the issue of using a sociotechnical systems conceptual framework in case study research to study a complex system. Utilization of a theoretical conceptual framework infused rigor into the case study method used (Yin, 1994). The research developed implications for the use of sociotechnical systems based conceptual frameworks in case studies of complex systems. Complex systems are those that are characterized by: (1) having a large number of variables, (2) dynamic interrelationships, (3) rich interconnections, and (4) probabilistic in nature since that the laws governing their behavior are not well understood (Jackson, 1991). Pava (1983) extended the sociotechnical system conceptual framework that was used in traditional

settings for use with non-routine office work characterized by nonlinear transformation processes. This research extends the use of sociotechnical systems theory into the political environment which is a nontraditional setting characterized by nonlinear conversion or transformation processes. Nonlinear conversion processes are characterized by steps that are not performed in a prescribed sequence, have no set points for input and output, and may be included in a set of multiple, concurrent, processes (Pava, 1983).

Significance of the Research

The results of this research contributed to the body of sociotechnical systems knowledge by extending the domain of sociotechnical systems thinking into nontraditional areas such as nonlinear public decision making. It also further refined the sociotechnical systems framework to make it suitable for the analysis of a technical decision making process. This will encourage its use in engineering, governmental and other nontraditional arenas. The case study method, when used in conjunction with the modified sociotechnical systems framework, was expanded as an approach to investigate the processes used by elected bodies. The same methods may be useful in other settings where access problems inhibit the use of traditional sociotechnical systems methods. The research also provides engineers and other technical professionals with insights into the political decision process.

Research Approach Overview

The research utilized a modified sociotechnical systems conceptual framework first applied by Pava (1983) to non-routine office work settings. In

order to use Pava's sociotechnical systems conceptual framework for this research an interpretation was made to suit the research setting. It was also adapted from its traditional use as a tool for design and intervention to a conceptual framework for analysis. The research used the modified sociotechnical systems conceptual framework in the analysis of case study data that was collected during the decision making process. Once the case study data was analyzed the case study narratives were drafted. The drafts of the case study narratives were reviewed by participants in the decision process. Their comments were used to verify the case study accuracy and develop implications for the application of this framework to future research.

Conventional Sociotechnical systems methods were developed around organizational systems that used linear, sequential, processes to transform inputs such as raw materials and information into outputs such as products or revenues (Fox, 1995). In the political environment transformations also occur. Inputs, for these systems are in the form of feasibility studies and other information and are transformed into outputs such as decisions that benefit the public. However, the transformations are not linear processes. The information is not transformed through a well defined and understood sequence of steps. There may be other transformations taking place based on the same information. The results of these transformations, both explicit and tacit, can result in a final decision to accept or reject the technical proposal. Although traditional sociotechnical systems methods work well on systems with linear processes, it is not well suited to system using nonlinear transformations. Since many

organizations have both linear and nonlinear transformations, sociotechnical systems practitioners have had to modify conventional sociotechnical systems concepts to deal with the non linear aspects of the organizations they were working with (Pava, 1983).

This application of sociotechnical systems to the evaluation process of a technical proposal in a public sector environment, where politics, public pressure and the media are part of the environment, drew upon Pava's application of sociotechnical systems to non-routine office tasks (Pava 1983). In his analysis of non linear transformations in the office setting, Pava focused on the deliberations that take place on various issues handled by management and staff. The deliberations, which are decidedly nonlinear, are surrogates for linear transformations that are analyzed in conventional sociotechnical systems analysis.

The system in which engineering decisions are made in a public setting is more nonlinear than the non-routine office work studied by Pava (1983). The primary difference is the greater complexity in the public setting environment Although the public and the media are usually not considered part of the system, their influence on the decision process is so great that they blur the bounds for these types of systems. Therefore, it is essential to account for their presence and potential influence in the evaluation of technical proposals in the public setting.

The research utilized the case study method. According to Yin (1994) (1) the case study method is especially suitable when it is difficult to separate

phenomena being studied from context and (2) study of the context can add to the understanding of the phenomena. The method can also deal with the situation when there are many more variables of interest than there are data points. Because of the lack of data points, a case study must rely on multiple sources of evidence. Another advantage to the case study method is that, unlike experimental methods, a case study can be used when the researcher has no control of events during the research. The richness of the research questions, the inability to separate the proposal evaluation from its context, the complexity of the proposal decision process, and the available data sources supported the adoption of a case study design for the research. (see Figure 1)

Data collection took place during the time period between the distribution of the feasibility study report to the subject localities and the decision vote that was taken by the localities' elected bodies. The decision process took place in both public and private forums. The proceedings of public meetings were recorded on audio tape by the researcher and recorded in official minutes by the town clerks. Citizens provided input through public comment in meetings. Post decision interviews were held with selected members of the town councils. Private discussions in which the researcher was involved were also recorded on audio tape or documented in the project journal. The data was then compiled into the case study data base for analysis.

Data analysis was accomplished through the case study process using the modified sociotechnical systems framework to structure both the data analysis procedures and the case study narratives. Data from the case study

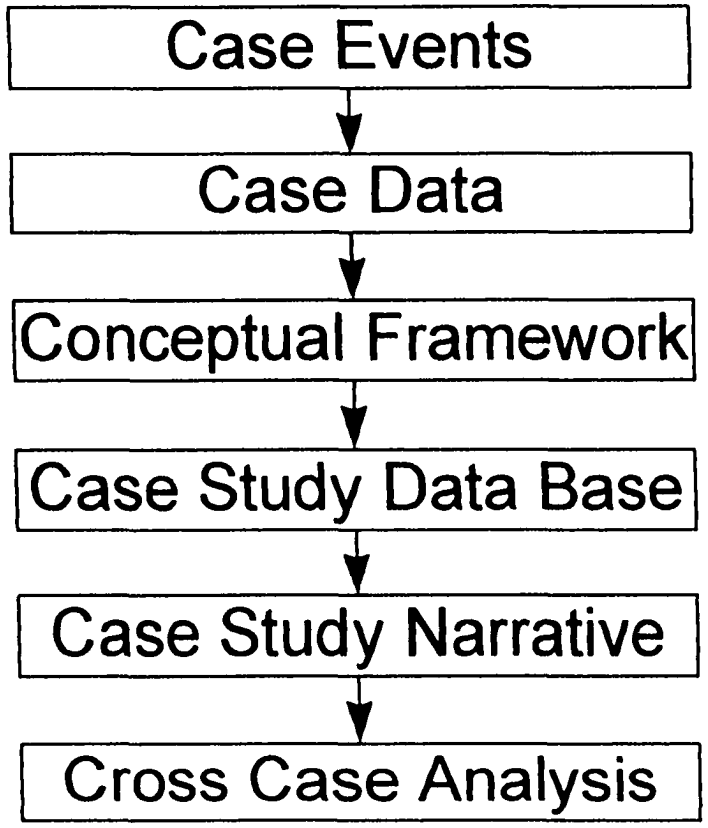

Figure 1. Research Approach

data base was compiled into the sections of the case study narrative based on criteria developed from the framework.

Document Organization

This dissertation is organized into eight chapters. (see Figure 2) Chapters I through IV deal with the research aspect of the dissertation. Chapter I contains necessary background information and an overall perspective for the research. It also contains the research questions and its purpose along with the general approach to the research and its significance.

Chapter II, the literature review, includes a development of the sociotechnical systems framework used in the research. It begins with the seminal works of the early sociotechnical systems practitioners and progresses through Pava's (1983) framework for use with non-routine office work. It then discusses the interpretations of Pava's framework that were necessary to make it applicable to the case in this study.

Chapter III discusses the issues, limitations, and appropriateness of the qualitative research approach. It begins by touching on qualitative methods in general and then focuses on the case study method in particular. A research perspective is established.

Chapter IV develops the research design. It traces all of the phases of the research from the initial selection of the case study method through the final interpretation of the results.

Chapters V and VI are the case study narratives They were developed with evidence from the data analysis. They are written using the same general

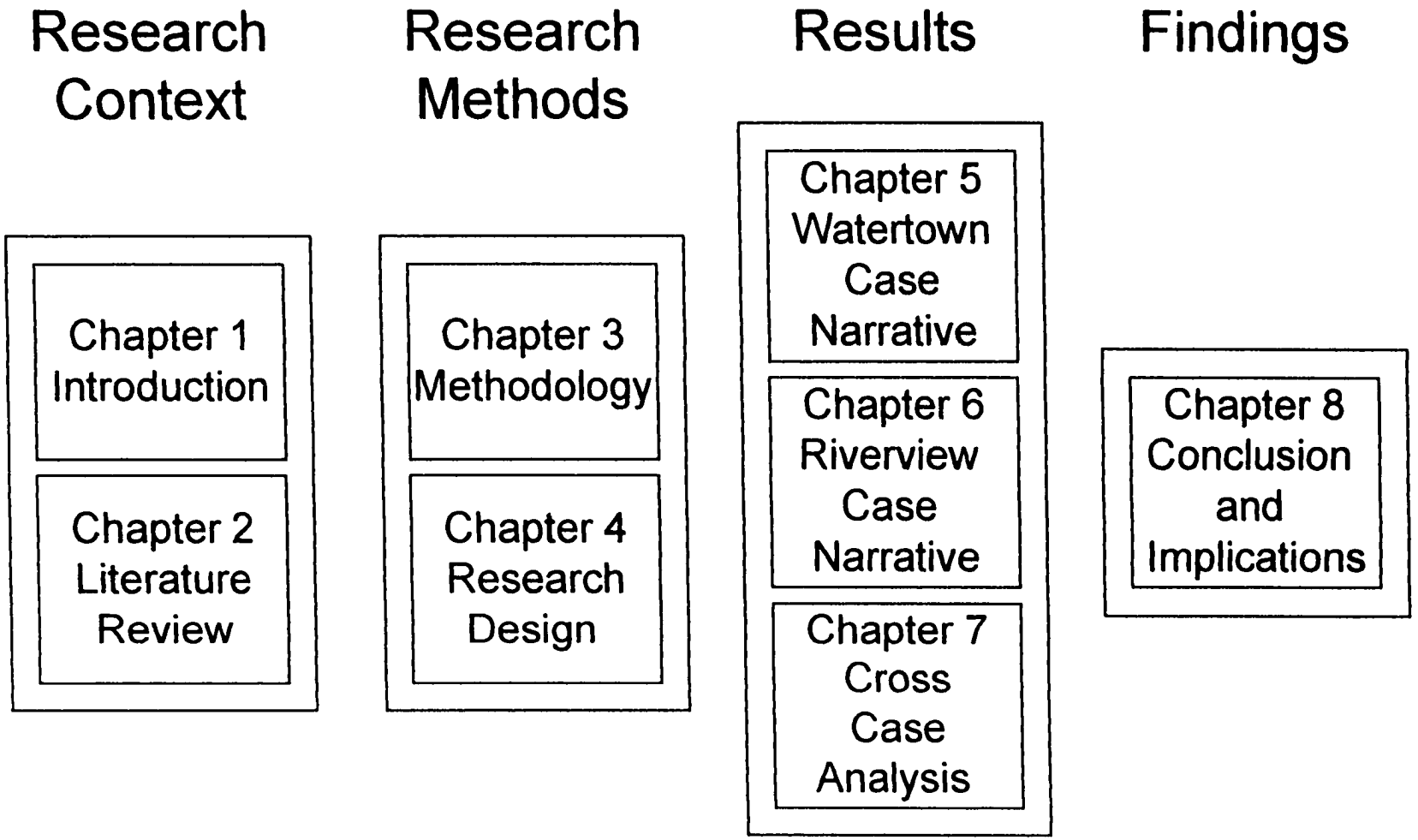

Figure 2. Dissertation Report Organization

structure as the sociotechnical systems conceptual framework used in the data analysis. Chapter VII follows the case narratives and includes the cross case analysis and case results.

Chapter VIII is the conclusion which reflects on the sociotechnical systems framework as applicable to this research. It also contains research based implications for sociotechnical systems theory and for engineering or technical practice. This is followed by a discussion of possible future research. The chapter concludes with a review of the research questions in light of the research results.

CHAPTER II

LITERATURE REVIEW

The purpose of the literature review is to establish the basis for the research within the context of the sociotechnical systems literature. It begins by noting the contributions of the early authors in the development of sociotechnical systems theory and framework. It then discusses aspects of traditional sociotechnical systems including the applications, design principles and models used for organizational redesign using sociotechnical systems. Next it explores some of the limitations and criticisms of sociotechnical systems concepts as well as changes in the framework that have been made to resolve some of these issues. In particular, it discusses in detail the framework developed by Pava (1983) to address the problems and move sociotechnical systems into nontraditional areas. The chapter concludes with a discussion of how the Pava conceptual framework was interpreted for application to elected bodies and as an analysis method for use in a case study. (see Figure 3)

Early Sociotechnical Systems Development

The initiation of the concept of sociotechnical systems began in the late 1940's and early 1950's in England. Ken Bamforth and Eric Trist of the Tavistock Institute began to investigate a few successful coal mines in England performance in the country's coal mining industry (Trist and Bamforth, 1951) The studies were undertaken using action research principles based on the work of Kurt Lewin (Lewin, 1946). Most of the coal mines at the time were organized

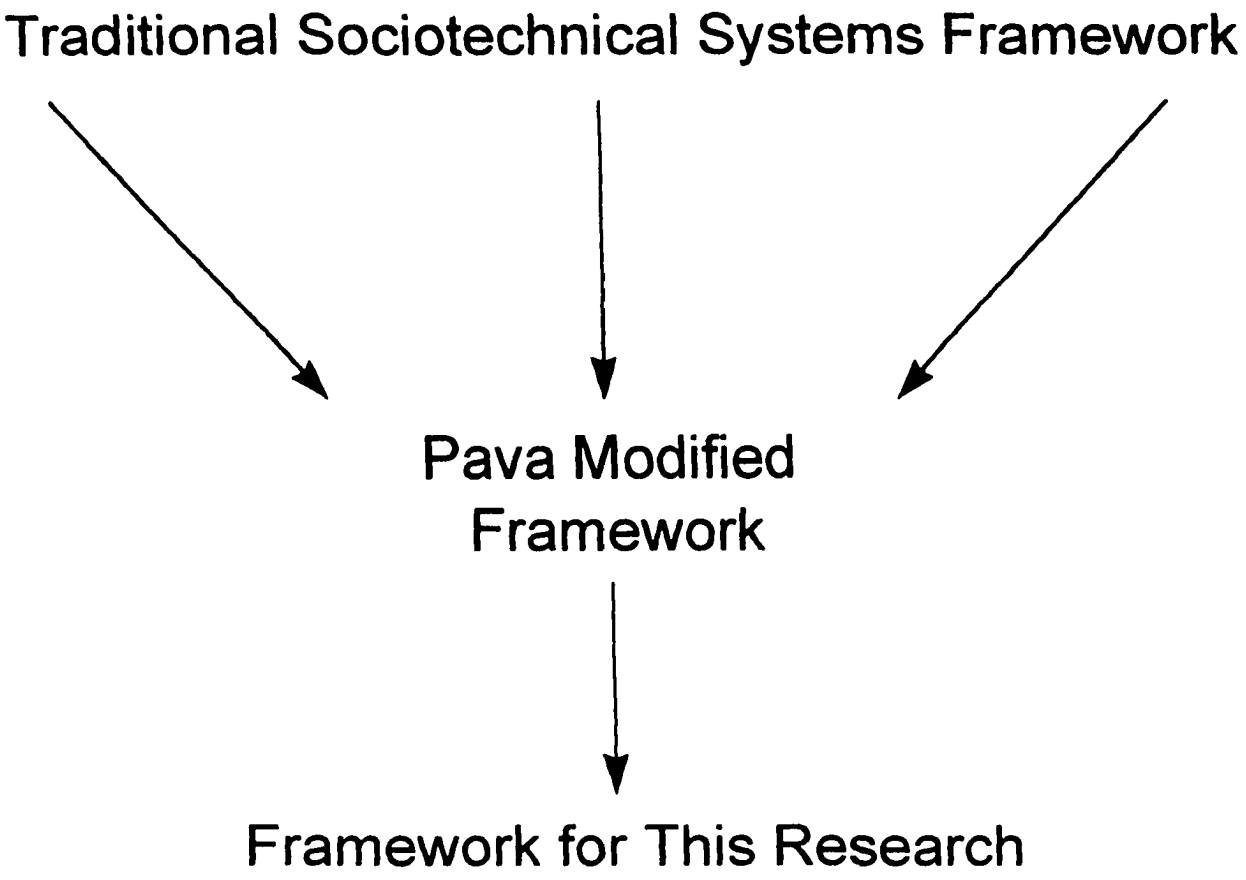

Figure 3. Literature Review Structure

in the traditional hierarchy in the manner of Taylor's scientific management concepts and Weber's "bureaucracy". The more successful mines were organized differently. Trist and Bamforth (1951) found that they were organized around small self regulating work groups. These groups organized themselves to perform the required work with a minimum of input from supervision or management (Pasmore and Khalsa, 1993; Fox, 1995). This small, work group oriented, organization, although common before industrialization, had almost completely been replaced by the hierarchical style of organization. During the late 1940's the coal mining industry was undergoing significant changes in the technology and methods used to extract coal. The human relations school of management, popular at the time, concentrated on the social and psychological aspects of organizations. It virtually ignored the role of technology in the dynamics of organizational life.

Trist and others at the Tavistock Institute began to develop the concepts for a management theory based on self regulating work groups that operate with a minimum if outside supervision (Fox, 1995). This thinking became the germ of the sociotechnical systems concept. Although generally thought of as a product of Ken Bamforth, Eric Trist and Fred Emery, Trist pointed out that the Tavistock Institute had many who contributed to the initial thoughts. Among them were Louis Davis, Philip Herbst, Cal Pava, A.K. Rice, Gerald Susman, Einar Thorsrud, Hans van Beinum, Richard Walton and Marvin Weisbord (Fox, 1995) There are some basic concepts that were developed by these early authors that underlie the development of sociotechnical theory and methods First, the organization

must be viewed as a system that converts inputs, such as materials or information, into a desired output such as finished products or new information. The system has the ability to regulate itself through feedback and is affected by the environment around it. Second, new organizational designs cannot be imposed from outside (Cherns, 1976; Keen and Morton, 1978). The members of the organization undergoing change should participate in its redesign. Third, jobs should be designed based on minimum specifications to maximize the contributions of the individuals and to allow freedom to adapt to changing conditions (Cherns, 1976; Pava 1983). And fourth, the organization is composed of both a technical subsystem (its tools and techniques) and a social subsystem (its human component and methods of coordination). The organization performs best when the two subsystems are well matched and complement each other (Kelley, 1978; Pasmore and Khalsa, 1993; Fox, 1995) Pasmore and Khalsa (1993) summed up the sociotechnical system approach by stating:

> The sociotechnical systems approach, that was developed out of the coal mining studies, considered an organization to be comprised of a technical system, including both the tools and the knowledge needed to perform the work, and a social system, which resulted from the combination of people, relationships, culture, management methods and experiences of working in the organization. As the technical system and the social system interact they determine the overall performance of the system and its ability to satisfy the financial realities of its environment [Pasmore and Khalsa, 1993, 553]

Early applications of sociotechnical systems took place in England, India and Norway. The work by the members of the Tavistock Institute in the coal

mines of England resulted in improvements in both productivity and worker morale. However, these experiments were not permitted to expand due to the concerns of mine management and the government mining authorities. The management saw the concept of self-regulation as being counter to their plan to intensify management control. The government coal authority saw the experiments as counter to their goal of fully mechanizing the nations mines (Osborn, 1990). A. K. Rice, one of the Tavistock researchers, introduced sociotechnical systems concepts, especially self-regulating work teams, to loom operations in a weaving mill in India in 1953. Despite problems with political and ethnic relations, the concepts were accepted by the workers in the mill (Osborn, 1990). This experiment was also prevented from spreading to other mills due to concerns of the mill owners who did not want to share power with the workforce (Trist, 1980).

Sociotechnical systems theory and methods gained a stronger foothold in the Scandinavian countries through the 1960's. By the 1970's over five hundred work improvement projects were ongoing in Norwegian machining and assembly industries (Osborn, 1990). A 1976 Norwegian law that gave workers the right to demand jobs that meet minimum psychological requirements has reinforced the sociotechnical systems movement in all of Scandinavia (Osborn, 1990).

Trist (1980) studied the fate of ninety of the original work team applications in large organizations in Europe and Scandinavia. He noted that a recession and the resulting layoffs had eliminated many of the teams. He also

noted that at that time there was still a lack of management support for the self-regulating work team concept (Osborn, 1990).

Throughout the 1950's and 1960's sociotechnical systems theory was developed and revised through multiple applications. Through these applications the principles of sociotechnical systems design emerged. Development has continued as sociotechnical systems principles have been applied to a wider variety of organizational settings.

Traditional Sociotechnical Systems Methods and Applications

The traditional setting for the application of sociotechnical systems based studies has been manufacturing industries. Of the sixteen studies Cummings (1978) reviewed, only two were in what would be considered non-traditional settings which included clerical work and key punching. The remaining fourteen were manufacturing processes, chemical production processes, weaving or mining industries. He concluded that sociotechnical systems was suited for production oriented systems and probably not readily applicable to service oriented work. Davis (1979) and Kolodny and Dresner (1986) investigated new plant work design based on traditional sociotechnical systems principles. Kolodny and Dresner noted that constant attention must be paid to assure that actual work practice remains consistent with the sociotechnical systems design principles. Susman and Chase (1986) performed sociotechnical systems analysis on integrated factories which extensively used computer management systems and robotics. They posit that factories in the future will require fewer management positions, and the workers will be responsible for only system

maintenance. Kolodny and Kiggundu (1980) performed a sociotechnical systems analysis on eight work groups engaged in mechanical woodlands harvesting. From the analysis they developed a sociotechnical systems based model which considered technical skills, task conditions (such as terrain), group interactions, group characteristics, organizational arrangements, and leadership and supervision. Kiggundu (1986) researched sociotechnical systems applications in developing countries and concluded that applications in those settings have been limited in scope. He noted that, although sociotechnical systems principles are sound, applications in developing countries require that they be modified to suit the local setting. Fox (1995) noted that sociotechnical systems theory was developed around routine linear work systems and was probably not as useful for professional or managerial work . There are some notable exceptions to this trend. Shani and Sena (1994) used sociotechnical systems based methods to facilitate the introduction of a local area network into a management information system. Chisholm and Ziegenfuss (1986) reviewed the applications of the sociotechnical systems approach in the health care industry. They concluded that, since no single technology dominated the industry, the sociotechnical systems analysis must be adapted to suit the specific technology at individual sites. They went on to say that further developments in the sociotechnical systems approach will be required for its use in the health care industry. Pasmore, Petee and Bastian (1986) applied sociotechnical systems analysis and intervention to two health care laboratories with no success. They attributed the lack of success to theory failure, method

failure, cultural factors, and learning failure. Taylor (1986) investigated the suitability of the sociotechnical systems approach through an application to the computer division of a large research and development organization. After reviewing the results of the design three and eight years after the intervention, he concluded that sociotechnical systems analysis was suitable for application to white-collar work settings. Shoonhoven (1986) investigated the possible application of sociotechnical systems principles in the development of space stations by NASA. She concluded that a sociotechnical systems approach was appropriate for the design of space organizations. Pava (1983) has applied a sociotechnical systems based conceptual framework to both routine and non-routine office work. In an analysis of one hundred thirty four sociotechnical systems applications Pasmore, Francis, Haldeman and Shani (1982) found that while sociotechnical systems interventions were successful, they focused more on the social aspects (e.g. autonomous work groups) than on the holistic technical and social system redesign intended by sociotechnical systems theory

Sociotechnical Systems Guiding Principles

Several basic concepts and guiding principles of sociotechnical systems theory emerge from the literature of sociotechnical systems.

(1) A sociotechnical system is a system of interrelated elements that transform inputs (materials or information) into desired outputs (finished goods or information) through a series of conversions (Pasmore, Francis, Haldeman and Shani, 1982; Pava 1983).

(2) Sociotechnical principles of work design seek to develop an organizational structure or job design that is better at integrating the organizations goals with its member's goals than a traditional hierarchical organization (Trist, 1980; Pasmore, Francis, Haldeman and Shani, 1982).

(3) Acceptance of change can only be brought about by involving those who will be affected. Therefore, the members of an organization must design the work. External agents can only act as facilitators of the process. The process of change in a sociotechnical system never ends since it must constantly adapt to a changing environment. Therefore, part of the development process must be to develop a continuous change mentality. Also, the concept of a design team, that proposes new ways to work, can only succeed if all levels of the organization are represented (Cherns, 1976, Pava, 1983).

(4) The sociotechnical systems model assumes that organizations are affected by their external environment and can, therefore, be termed open systems. The environment can be classified into two levels. The transactional environment consists of elements outside the system that affect its performance and with which it interacts. The contextual environment includes elements that affect the performance of the system but are beyond its direct influence (Pasmore, Francis, Haldeman and Shani, 1982, Pava, 1983).

(5) The technical and social subsystems must complement and support one another. This is accomplished through joint optimization by adjusting the

size, scope and importance of each subsystem to match. Emphasizing one subsystem at the expense of the other is detrimental to the system (Kelley, 1978; Trist, 1980; Pasmore, Francis, Haldeman and Shani, 1982; Pasmore and Khalsa, 1993; Fox, 1995).

(6) Work systems can regulate many of their own activities through feedback by using information gaps between the desired and actual output or goals (Pava, 1983; Pasmore and Khalsa, 1983).

(7) Fractionated work causes gaps where errors can occur. Work should be restructured by combining such that the work produces completed components. This will reduce the number of gaps and minimize the probability of errors (Kelley, 1978; Pava, 1983).

(8) High performance is the result of controlling variance and eliminating errors at the source. The person at the source, who is in position to correct the errors, must have immediate awareness of them and the skills and authority to take corrective action (Cherns, 1978; Trist, 1980).

(9) The task of controlling errors can be the most satisfying aspect of a job. Commitment to a job is more likely if a worker's needs are satisfied through the job itself (Trist, 1980).

(10) Self-regulating work teams offer one way to provide the authority to correct errors at the source. Satisfaction increases with the number of variances controlled by the group. Existing boundaries between functional departments should be adjusted to facilitate control of variance in an interdependent manner (Cherns, 1978; Trist, 1980).

(11) Performance is dependent on a combination of many different elements, only one of which is the role of the individual. The organization must also be internally consistent to achieve high performance (Cherns, 1978; Trist, 1980).

(12) There must be a fit between the objective of the organization and the process used to design the work system. Only a design process that reflects high performance can design a work system that produces high performance (Cherns, 1978; Trist, 1980).

(13) Policies, especially personnel policies, must be designed to support the organizations objectives. Organizational design must be consistent with a high quality of work life (Cherns, 1978; Trist, 1980).

(14) Sociotechnical systems design mandates that supervision be based on facilitation, not decree. Supervisors need only set minimum specifications This maximizes the potential for workers to contribute and allows for continuous adaptation and improving performance (Cherns, 1978, Pava, 1983).

(15) Sociotechnical systems mandate that boundary management is an important element in performance management. It is important to be sure that work teams have adequate resources, can coordinate with other teams and can foresee events that may influence their work processes. Managers manage the boundaries to let the work group manage its own activities (Cherns, 1978; Trist, 1980; Pasmore, Francis, Haldeman and Shan, 1982)

(16) Information flow is essential to the control of variance. System design must ensure unimpeded information flow (Cherns, 1978; Pasmore, Francis, Haldeman and Shani, 1982).

(17) Sociotechnical systems design emphasizes the view of the entire work group as a functioning whole rather than individual jobs or positions. The individuals tasks are changeable depending on the requirements placed on the work group by the environment (Trist, 1980; Pasmore, 1988).

(18) People are treated as valuable parts of the organization. Work groups enhance the relations among people at work (Pava, 1983; Pasmore, 1988).

(19) Sociotechnical systems theory maintains that the best way to maintain adequate variety is to give individuals more complex work roles and redundant functions. That will enrich the variety and the capabilities of the individuals. Increasing the variety in the individuals also increases their capability for self-regulation and the ability of the organization to respond to changes in the environment (Pasmore, Francis, Haldeman and Shani, 1982; Pava, 1983).

(20) The technical subsystem does not entirely determine the nature of the social subsystem. There can be several alternative social subsystem designs to suit a specific technical subsystem (Trist, 1963; Kelley, 1978; Pasmore, Francis, Haldeman and Shani, 1982).

The basic sociotechnical systems principles listed above have been used to develop a basis for sociotechnical systems design of organizations. Through the 1960's and 1970's, the process of sociotechnical systems design was

refined. Cherns (1978) compiled the design concepts from various authors, mainly Emery and Trist (1972) and Herbst (1974), into a set of design principles These principles correspond almost precisely to the guiding principles listed above. This also demonstrates the maturity of sociotechnical systems by the wide acceptance of the principles as defining the sociotechnical considerations for design.

Taylor and Felton (1993) noted four other concepts concerning sociotechnical systems as it is viewed from the North American perspective. They are:

> Organizations can be "purposive" (i.e., have the appearance of having a purpose, but no one is sure what it is) or "purposeful" (i.e., having a purpose that is known to the employees) and the latter is superior.
>
> Focus on system " product", or output, represents a radical and effective change from the historical (and still present) North American work design focus on activities and behaviors.
>
> North American managers and labor leaders recognize the chaos in their environments and are beginning to understand that the "tried and true" mechanistic organizational models are no longer appropriate.
>
> The best organizational intentions are helpless in achieving their ends if people throughout the organization are disinterested in or distracted from, participation in this essential task [Taylor and Felton, 1993, 2]

Traditional Models for Sociotechnical Systems Analysis and Design

Models for use in organizational redesign were developed based on sociotechnical systems design principles. These models are comprised of both analysis and design components. Two examples of these models are the model

described by Pasmore (1988) and Taylor and Felton (1993). Both models are prescriptive,but they emphasize different phases in the design process.

The Pasmore (1988) model covers the entire sociotechnical systems design process and gives each phase equal emphasis. (see Figure 4) It prescribes what needs to be accomplished at each step. The model begins by defining the scope of the system to be redesigned and setting the ground rules for the process. It determines the need for change, the potential for success and the time and cost of the change process. This first step is also concerned with getting agreement on the change model to be used and the expectations of the organization. It selects a change steering committee and has them commit publicly to the change process.

The process then determines the environmental demands on the organization that would impact the design process. The results of the initial phases are used by the steering committee to develop a vision statement or charter for the organization. Throughout the process there is ongoing education of the members of the organization as to both the sociotechnical systems principles and the change model. Later, as the design develops, they are educated on their new roles in the organization.

A change structure is created by forming a team to conduct the actual redesign. This step includes defining the relationship between the design team and the steering committee. The design team then conducts the sociotechnical systems analysis which consists of the environmental scan, technical analysis and social analysis. Once the analysis is complete the results are used to

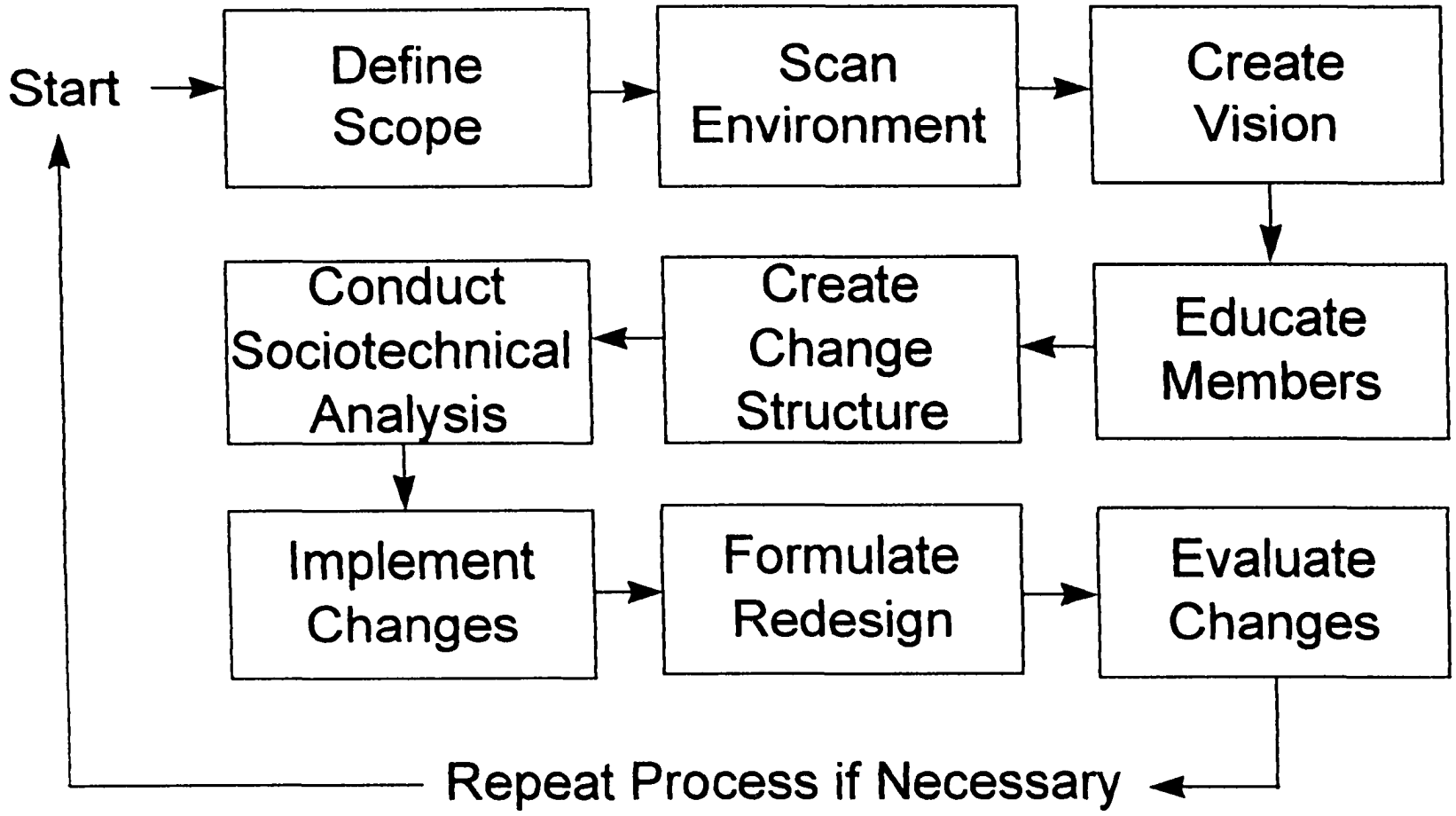

Figure 4. Pasmore Sociotechnical Systems Intervention Model

develop redesign proposals that are consistent with sociotechnical systems principles and the organization's vision. These are reviewed and agreed upon by both the design team and the steering committee.

The Pasmore (1988) model then implements the changes that were agreed upon by delegating the responsibility for the changes to individuals. The model includes provisions for redesign if made necessary by changing environmental conditions.

The Pasmore (1988) systems change model consists of nine steps which are to:

(1) Define the scope of the system to be redesigned

(2) Determine environmental demands

(3) Create a vision statement

(4) Educate the organizational members

(5) Create a change structure

(6) Conduct sociotechnical systems analysis

(7) Formulate redesign proposal

(8) Implement the recommended changes

(9) Evaluate the changes and redesign if necessary

The Pasmore (1988) change model is typical of many change models using a sociotechnical system approach. It provides a prescriptive step by step approach to the organizational analysis and redesign process.

The Taylor and Felton (1993) model puts more emphasis on the mechanics of performing the sociotechnical systems analysis steps. These

steps have been used by other authors such as Emery and Trist (1978) and Pava (1983). The Taylor and Felton (1993) model begins by articulating four phases (*discovery, understanding, design, implementation*) and the steps necessary for each phase. The first phase, *discovery*, begins the intervention by educating the management and employees of the organization about sociotechnical systems principles and about the redesign process. This is meant to evoke a paradigm shift in the organization that is consistent with sociotechnical systems. (see Figure 5)

The model then moves into the *understanding* phase, consisting of the three elements of sociotechnical systems analysis. The open system scan considers the organizational and system boundaries. It also analyzes the demands that the environment puts on the organization. From this a purpose definition for the organization is developed. The technical subsystem analysis considers the transformation or conversion processes in the system. It determines sources of variance and evaluates means to control the variance using a variance matrix and variance control table. The social subsystem analysis considers the roles of the individuals through the use of a role network and the social systems grid. It also considers quality of work life issues.

The results of the analysis are used in the *design* phase to produce a provisional design work system through joint optimization of the technical and social subsystems consistent with sociotechnical systems principles. The provisional design is then applied in the *implementation* phase through a series

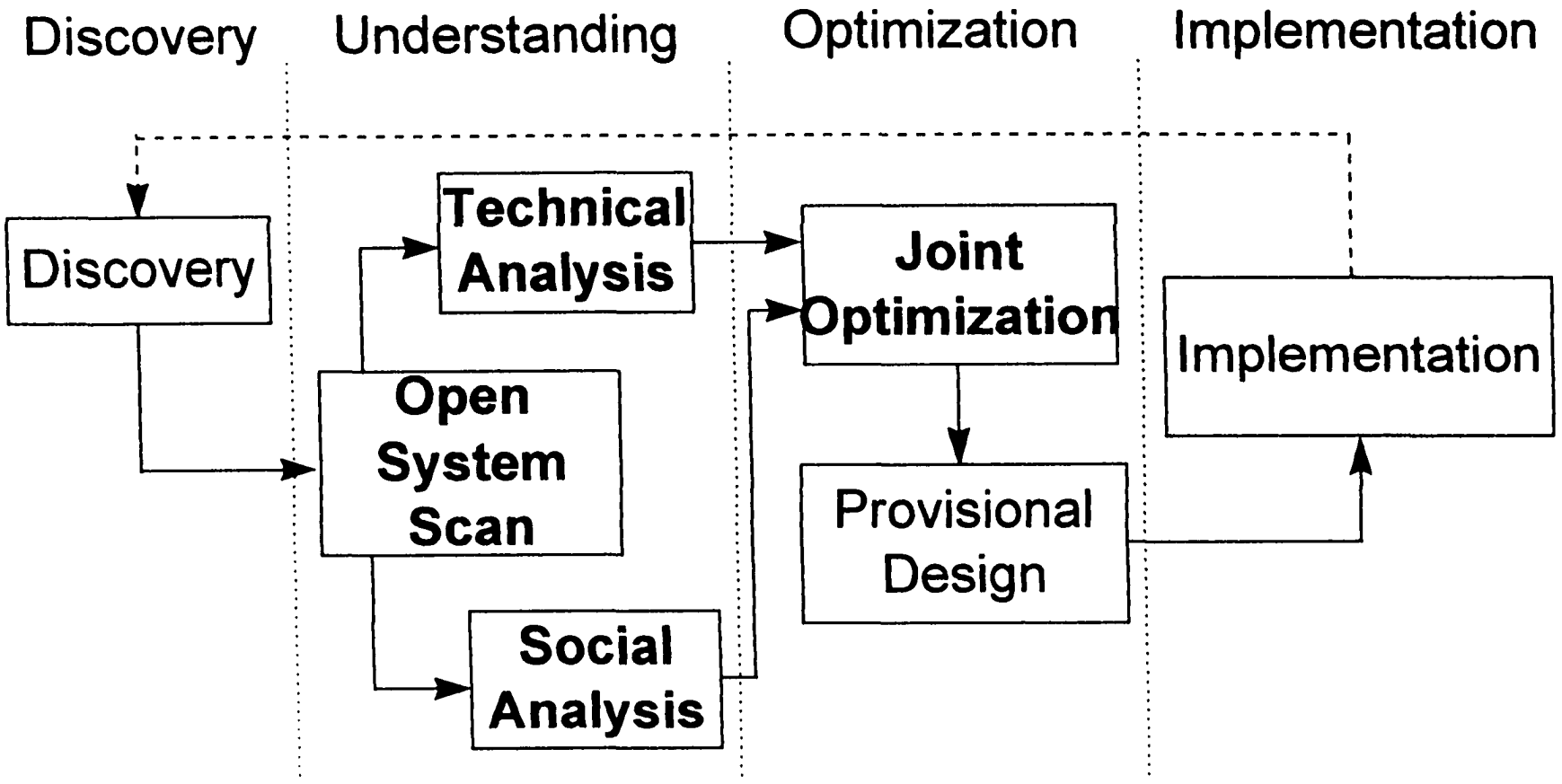

Figure 5. Taylor and Felton Sociotechnical Systems Intervention Model

of steps which include planning, subsystem design, evaluation and possible redesign.

Although they may be divided differently, The Pasmore (1988) nine step "sociotechnical systems change model" and The Taylor and Felton (1993) four phase "process of sociotechnical systems" share many of the same components. Steps four through nine of the Pasmore (1988) model are consistent with the four phases of the Taylor and Felton (1993) model. Both approaches are consistent with the "Analytical Model for Sociotechnical Systems" developed by Emery and Trist (1980). This shows the degree to which the sociotechnical systems approach has become standardized through continued development and application.

Sociotechnical Systems Analysis

The environment, technical subsystem and social subsystem constitute the core components of a sociotechnical system. Analysis of these components is a basic part of most of the sociotechnical systems design models. The environmental scan or open systems scan examines at the system from an overall perspective (Pava, 1983). It is comprised of five elements:

(1) Identify the environmental influences, including the influences from both the transactional and contextual environments, that affect the performance of the system.

(2) Specify the inputs and outputs of the system. Determine not only what they are but where they enter or leave the system.

(3) Identify features of the overall organization that may influence the design requirements including historical, social and physical features.

(4) Have the members of the system formulate a mission statement which defines the objectives of the system and the organization.

(5) Formulate a philosophy which stipulates the organization's ground rules on how employees are to be treated.

The technical subsystem is defined by Pasmore (1988) as "...the tools, techniques, devices, artifacts, methods, configurations, procedures, and knowledge used by organizational members to acquire inputs, transform inputs into outputs and provide outputs or services to clients or customers" (Pasmore 1988,55). Analysis of the technical subsystem requires identification of the components of the conversion process that cause error or variance to occur in the use of the tools and techniques. Variance, in sociotechnical systems terms, is defined as " ...aspects of the conversion process that can go awry. The most important factors are called key variances" (Pava, 1983,19). This is consistent with other perspectives of variance by authors of the sociotechnical systems approach (Cherns, 1976; Emery and Trist, 1978; Pasmore, 1988; Taylor and Felton, 1993).

Sociotechnical systems seeks to control variance at the point where it occurs. Pava (1983) offers the following steps in the analysis of the technical system which include:

(1) Specify each step in the conversion process

(2) Identify unit operations and compile them into groups that produce a tangible product to simplify further analysis.

(3) Specify the variances in the conversion processes that must be controlled and match with the particular points in the conversion process where they occur.

(4) Determine the relationships between the variances themselves and between the variances and the conversion process using a variance matrix.

(5) From the variance matrix develop a variance control table. Designate the key variances, the operations where the key variances can be controlled, the individuals in the best position to control the variances, information sources that are required for control and any technical or social improvements that may help control the variances.

Pava's (1983) approach to technical subsystem analysis using the variance approach is consistent with other approaches and models of sociotechnical systems redesign, including Pasmore (1988) and Taylor and Felton (1993). The method of variance analysis, using the variance matrix and variance control table, is also common to all three models. This approach to technical subsystem analysis is also consistent to the approach developed by Emery and Trist (1978).

The social subsystem is defined by Pasmore (1988) as being

> ...comprised of work in the organization and all that is human about their presence. The social system encompasses their attitudes and beliefs; the implicit psychological contracts between

> employers and employees; reactions to work arrangements, company policies, and design features; relationships between groups, among group members, and between supervisors and subordinates; cultures, traditions past experiences and values; human capacities for learning and growth as well as sabotage and collusion; power and politics; individual personalities and group norms; the potential fore motivation or alienation; for loyalty or distention; for cooperation or conflict; and remarkable, uniquely human emotions such as love, hate, greed, charity, anger, joy, fear, pride, devotion, jealousy, compassion and excitement. [Pasmore, 1988, 25]

The social subsystem analysis begins by mapping the roles of the various individuals that are involved in the conversion process in a role network diagram (Pava, 1983; Pasmore, 1988; Taylor and Felton, 1993) The nodes in the diagram represent how the individuals contribute to the overall work system. Each role is then investigated to determine if it includes functions that, according to sociotechnical systems principles, will lead to high commitment and performance.

The Pava (1983), Pasmore (1988) and Taylor and Felton (1993) models all utilize the role network as their primary method for social subsystem analysis. This, along with commonality in the methods used for technical subsystem analysis, is further evidence of the degree to which the sociotechnical systems approach has been standardized.

Limitations and Challenges to Traditional Sociotechnical Systems Methods

Sociotechnical systems methods have mostly been applied to systems with linear conversion processes. Practitioners have avoided using sociotechnical systems methods in the growing numbers of systems with

nonlinear conversion processes. Without well defined inputs and outputs as well as well defined conversion processes, it is difficult to use the variance matrix techniques of traditional sociotechnical systems analysis (Fox. 1995) These processes might also characterized as complex from the perspective of Jackson (1991).

Pava (1983), commenting on the problems of using the variance matrix techniques with nonlinear systems, said:

> The variance matrix concept is rooted in the sequential interdependence of production steps: Errors upstream make control of certain errors downstream more difficult. In systems with non-linear conversion there is no sequence of steps; progress is made in the absence of clear-cut beginnings and ends. However interdependencies do exist in non-linear conversion. For example, an error at certain steps of the process may interfere with control of all other variances. Sometimes the effects of an error reach upstream , rendering earlier operations invalid. In such cases *interdependence is virtually saturated:* It seems that everything totally depends upon everything else. This situation seems to invalidate the sociotechnical systems assumption that upstream variances affect down stream operations selectively [Pava, 1983, 51].

Sitter and Herzog (1990) noted that the design should be based on future variance conditions which is something that the variance matrix technique does not take into account. Another criticism is that there has been a tendency to use the self-regulating work group concept, that originated with sociotechnical systems, as a standard approach to organizational redesign rather than developing unique solutions (Fox, 1995). This over dependence on self-regulating work groups is further support for Pasmore, Francis, Haldeman and Shani's (1982) findings based on analysis of sociotechnical systems interventions.

Pasmore (1995) commented that there are inadequacies in sociotechnical systems theory and application that have inhibited sociotechnical innovation He suggests that further research is needed to develop a dynamic model of organizations and their environment and to broaden the focus of sociotechnical systems theory from short-term success to long term stability.

Vocational separatism may also be an impediment to the work group concept (Pava, 1983). Pava (1986) also noted that:

> Many professionals doing non-routine tasks are extensively trained specialists...all their expectations about work activities, career advancement, and reward emphasize individual contributions. Because specialization is extreme and not highly transferable, shared skills are not likely to be a source of cohesion, making autonomous work groups an impractical solution [Pava, 1986,205-206]

The traditional sociotechnical systems methods have a reliance on unitary goals; that is, all of the individuals in the system are striving towards the same ends. This is not necessarily true for all traditional sociotechnical systems let alone nonlinear systems (Jackson, 1991).

Problems have been reported concerning management's hindering of the initial sociotechnical system interventions or not sustaining the changes once the intervention was complete was first noted in the loom shed applications in India (Trist, 1980). Kiggundu (1986) concluded in his study of sociotechnical systems applications in developing countries that some of the limitations of using sociotechnical systems methods in these settings were limitations in the indigenous managers and other local stakeholders.

Sociotechnical Systems Approaches for Nontraditional Applications

Emery and Trist (1978) and Mumford and Wier (1979) took similar approaches to developing a sociotechnical systems based model for the redesign of nontraditional systems. The model follows the traditional method except in the technical analysis step. It does not depend on the systematic analysis of conversion processes by variance analysis which is required by traditional sociotechnical systems technical subsystems analysis (Pava, 1983). The technical analysis involved generating a definition of the objectives of the organization against which activities are judged. The inputs are tracked to their corresponding outputs and then the outputs are compared to the objectives. The model does, however, consider the roles of the workers as in the traditional model and measures those roles against psychological job requirements (Emery and Trist, 1978). The next step in the model is to propose changes to the organization so that the system outputs will meet the organizational objectives The design should include performance measures, such as management by objectives, to provide feedback to the people occupying the various work roles Emery and Trist (1978) caution, however, that many outputs of these type systems are not easily measured, and other means may be required to include them in performance targets. A significant difference between this approach and the traditional sociotechnical systems approach is that Emery and Trist's approach does not emphasize the self-regulated work group concept (Pava 1983).

Pava's Framework Applied to Non-Routine Office Work

Pava (1983) developed what he termed a "contingency theory of sociotechnical design for office settings". This conceptual framework could be applied to a range of different office work situations. At one extreme, Pava (1983) considered what he termed routine office work which was characterized by linear conversion flows, a unitary conversion stream and workers with a pooled identity. At the other extreme was what he termed non-routine office work. It is this part of Pava's contingency framework that best addresses the criticisms of sociotechnical systems noted above. (see Figure 6)

Pava (1983) described non-routine office work as having the following characteristics:

(1) It deals with issues that are not completely rational

(2) It has a high degree of uncertainty

(3) There is disagreement among the parties as to what the problem and possible solutions are.

(4) Outputs emerge after a disjointed and seemingly random process.

(5) Individuals may exhibit "vocational separatism" (Pava, 1983).

Vocational separatism is similar to Jackson's (1991) perspective of a complex system with pluralistic goals where there is not a shared or common set of objectives, interests, or agreement on means to proceed. This can be characteristic of highly trained individuals with unique skills and a high degree of authority.

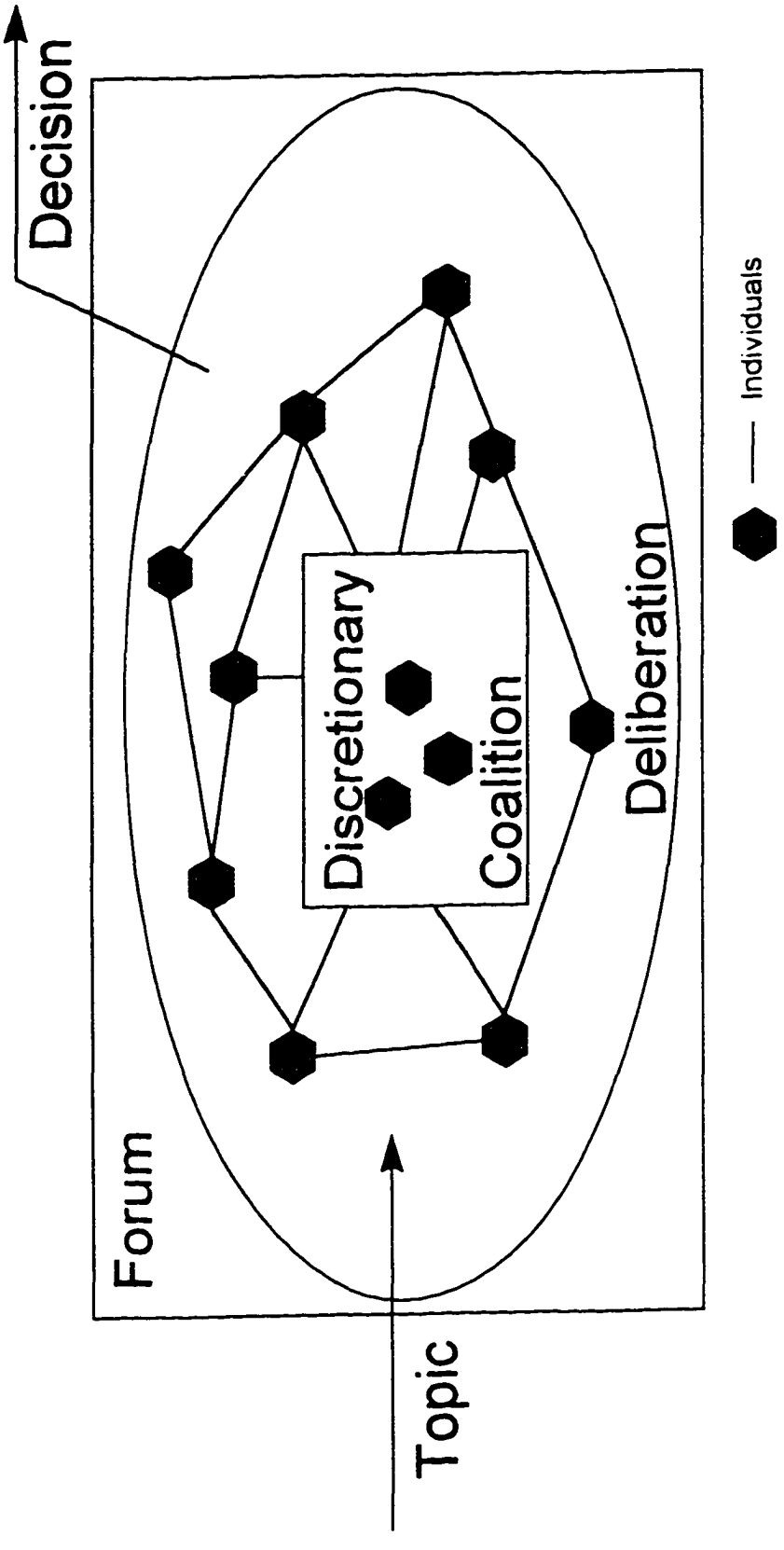

Figure 6. Pava Modification to Sociotechnical Systems Conceptual Framework

This conceptual framework for non-routine office work differs from the traditional sociotechnical systems framework mainly in the analysis phases. In the technical subsystem analysis, this modified framework uses deliberations as a unit of analysis analogous to conversions or transformations in the traditional sociotechnical systems framework. Pava (1983) defines deliberations as:

> ...reflective and communicative behaviors concerning a particular topic. They are patterns of exchange and communication in which people engage with themselves and others to reduce the equivocality of a problematic issue. Deliberations have three salient aspects: topics, forums of exchange and participants; the analysis of deliberations must consider each in turn [Pava, 1983, 58]

Topics are the subjects of deliberations and are unique to the organization. Some are only internal to the organization, but others may have effects beyond the organization. They are the problematic aspects of the organization about which people reflect and communicate.

Deliberations take place in forums of exchange. They can be structured, semi-structured or unstructured. They differ in how they are scheduled and their adherence to procedure. Pava (1983) posits that more important topics will be deliberated in a wider variety of forums and that politically sensitive topics will tend to be deliberated in private forums. Deliberations are not decisions. They "are a more continuous affair from which decisions occasionally emerge" (Pava, 1983, 59).

The analysis framework for this research, as applied to the technical subsystem analysis, also considers confusion in deliberations as a form of variance. The analysis investigates attempts to reduce confusion to make

deliberations more effective. This is consistent with Pava's (1983) framework

The steps for the technical subsystem analysis under the modified framework

include:

> listing the deliberations underway in the organization; set priorities for each deliberation that are important in light of the unit's mission statement; select major deliberations that require the most analytic scrutiny.
>
> Identifying the different forums (structured, semistructured, and unstructured) of each major deliberation.
>
> indicating who is and who should be a party to each major deliberation. for all parties note what information they deposit and withdraw (this is a rough list to be saved for reference during the social analysis)
>
> specifying obvious or recurring errors and information gaps at which deliberations go awry in every forum for each major topic.
>
> analyzing the component activities of office work .... Strung together by forums in reference to topics , these activities become the medium of deliberations; and for any deliberation there is usually room for improvement in the discrete activities it involves.
>
> relating component activities and deliberations in a matrix format (the resulting display insures systematic diagnosis and includes a great deal of information. [Pava, 1983,62-63]

Pava suggests that the technical analysis should be done in iterations and revisions made until an acceptable description of the deliberation - activity relationships is produced. He also notes that the traditional variance matrix approach may be useable in some cases (Pava, 1983).

In the social subsystem analysis Pava (1983) uses the traditional role network method but focuses on the values that participants advocate, divergent values among the participants and discretionary coalitions that form among the

participants. He posits that discretionary coalitions are necessary to be able to reach consensus on topics given divergent values among the participants.

> Pava breaks the social subsystem analysis down into four steps:
>
> For each major deliberation, map the role network consisting of the parties who now partake or could helpfully partake in it.
>
> For every party identified with a deliberation, list the values that the participants characteristically champion.
>
> Looking down the listed values for each deliberation, identify divergent values, that is, diametric opposites: the trade-offs that must continually be made to render the deliberations useful; and the most problematic trade-offs.
>
> For every deliberation, identify interdependent parties - people with divergent values who are engaged in the same deliberation and must continually work at forging a discretionary coalition that can make intelligent trade-offs among its members for the sake of some long term general interest [Pava, 1983, 63-64].

Pava (1983) applied his "contingency theory" to the office unit of an electronics supply firm. He used the traditional framework for the components of the office unit that performed routine office work. He applied the modified framework to the components of the office unit that were engaged in non-routine office work that involved deliberations. He used a hybrid approach to those office settings that exhibited characteristics of both types of office work (Pava, 1983).

Extension of Sociotechnical Systems Into a Political Environment

This research applied sociotechnical systems theory to a new setting - elected governmental bodies. It also used a sociotechnical systems conceptual framework as an analytical method to conduct a multiple case study. Both of

these are unique to this research and extends the use of sociotechnical systems theory beyond the current literature.

In this setting (elected governmental bodies) many of the characteristics that Pava (1983) ascribes to non-routine office work are even more pronounced. The elected bodies on the local level are only together at meetings scheduled on a weekly or monthly basis. There is little opportunity for them to meet privately and there are regulations that constrain how they can meet. Therefore, they are even less likely to share a pooled identity, and they will tend to identify with a constituency in the environment which also tends to reinforce the non-unitary nature of the system (Jackson, 1991).

Pava's (1983) use of deliberations as a unit of analysis suits this setting because an elected body converts or transforms information almost exclusively through the use of deliberations. However, the modified framework required some interpretation to suit the setting and to be used as an analytical method for a multiple case study. Only the sociotechnical systems analysis components of the modified framework were required for the data analysis. The technical subsystem analysis was made more specific by interpreting the unit of analysis, deliberations, to suit the setting. In the conceptual framework used for the research deliberations were a process by which information in the form of a topic was evaluated with respect to issues to reach a consensus on the merits of the topic. Issues were value laden concepts with respect to the elected body Elected bodies have standing issues against which almost all topics are evaluated. There may also be topic specific issues Issues can be resolved or

remain unresolved with respect to the topic. Unresolved issues are a source of confusion or variance and are primarily caused by the lack of clear information. Major issues must be resolved for an elected body to reach consensus on the merits of a topic. The interpreted conceptual framework is suitable to develop categories to classify data extracted from the cases to use as evidence in development of the case study narratives.

Summary

This chapter has traced the development of sociotechnical system theory from its inception to its establishment as a valuable tool for organizational intervention and redesign. It described the traditional sociotechnical systems approach and discussed some of its applications. While most of the work has been performed on traditional work systems with linear conversion processes there have been attempts to develop sociotechnical systems approaches to address non-linear work settings. Pava (1983) successfully modified the traditional approach to suit non-traditional organizational settings that feature non-linear conversion processes by using deliberations in place of conversions in the technical subsystem analysis. His work was used for this research as a launching point to extend sociotechnical systems into a nontraditional class of organizations - elected governmental bodies. To apply the Pava (1983) modified framework to the nonlinear systems analyzed in this research, deliberations were further interpreted as a method by which topics are evaluated against issues. The framework could then be applied as an analysis method for case study research.

CHAPTER III

RESEARCH METHODOLOGY

The purpose of this chapter is to establish the methodological basis for the research design. The first part of the chapter discusses qualitative methods in general and applicability to this type of research. It also discusses some of the criticisms of qualitative methods, particularly in contrast to conventional quantitative methods. The remainder of the chapter focuses on the case study method. It includes discussion of the various types of case studies and discusses some of the controversy surrounding case study as a serious research method. It concludes with a discussion of case study design issues including issues concerning validity.

The Qualitative - Quantitative Distinction

The research method chosen for this investigation is the case study Case study is considered a qualitative method, although, in some instances, case study data can be analyzed using quantitative techniques. Qualitative research methods have long been the topic of debate in the scientific community in terms of their relevance in serious scientific inquiry (Guba and Lincoln, 1981;Sandelowski, 1986; Whitt, 1991; Strass and Corbin, 1990). This chapter does not propose to dispose of the long standing debate concerning qualitative and quantitative research approaches. However, it is important to establish the research perspective taken for this particular study.

The perspectives of qualitative and quantitative approaches to research methods are rooted in the types of data gathered and methods of analysis to draw conclusions. In the past, the primary distinction was basically from the perspective of variables. Quantitative variables are those that can easily be assigned numerical values and are reduced for mathematical analysis. These values can then be handled mathematically, thereby taking much of the subjectivity out of data analysis (Kerlinger, 1986). The tradition of using quantitative variables comes from the physical sciences and is considered an essential part of the scientific method. Using numerical variables provides rigor in the experimental process which is considered the mainstay of the scientific method. Experiments which are based on numerical measurement, using mathematics as their language, allow the results to be verified by other researchers through numerical data analysis and repeated experiments. Poplin (1987) summarized the basis for quantitative methods as: (1) the data must be amenable to mathematical analysis which requires the study of variables that can be quantified, (2) separation between the researcher and the subject as well as isolation of the subject from influences beyond the control of the researcher, (3) objectivity on the part of the researcher, (4) the necessity of a hypothesis for testing and deductive analysis, and (5) the ability to be replicated to be considered valid.

The behavioral and social sciences contrast with the physical sciences in that the variables they deal with are not, in most cases, measurements of physical phenomena. Instead, they are issues of human, or in some cases

animal, behavior. In most cases behavioral data is not a direct physical measurement. Instead, it relies on the evaluation of variables that do not lend themselves to description in numerical terms or to mathematical reduction. These types of variables have been termed qualitative. As such, qualitative research designs have been argued to be appropriate to address organizational phenomena that are complex and not readily quantifiable (Peshkin, 1988; Searight, 1989).

In order to deal with qualitative variables and still maintain rigor in the research design, most behavioral and social researchers designed their research such that these variables could be transformed into some numerical values that could then be analyzed mathematically, most often through statistical analysis. Handling qualitative variables in this manner gave the research a structure that resembled research done in the hard sciences which allowed independent verification of at least the data analysis through mathematical methods. Thus, rigor was achieved through research designs amenable to replication. It does not, however, imply that there is repeatability in the entire process because the initial data collection and the coding of the qualitative data into quantitative terms is still subjective. In fact, Denzin and Lincoln (1994) have argued that the establishment of hypotheses and variables is, in effect, a subjective act in itself. Poplin (1987) points out :

> The generation of explanatory or relational hypothesis is basic to quantitative inquiry. This statement contains all of our biases; it represents a subjective guess ready to be verified. It requires the narrowing of data for analysis and thus denies or avoids implications of

> other contextual data. It is drawn from the experience of the authors [Poplin, 1987, 35]

This is also consistent with Steier's (1993) recognition of the inescapable influence of the researcher and the contention that research is reflexive in nature since it is constructed by the researcher.

Kerlinger (1986) notes that in many cases the term qualitative is used to describe what he terms categorical variables, that is, variables where the data that can be analyzed by sorting it into two or more categories and then can be easily transformed into numerical form. This is in contrast to quantitative data which is in the form of measurements on some continuous scale. Kerlinger questions whether the former is really a separate classification of just a subset of quantitative methods (Kerlinger, 1986).

There is some question whether data handled categorically can accurately describe the behavioral phenomena that the researchers are investigating. Much of the richness in the data and the context may be lost in the coding process.

Patton (1990) concludes that traditional quantitative researchers are limited by *hypothetico-deductive* methodologies which come from the natural sciences and predominates social science. It is the tradition in science that hypothetico-deductive methodology which involves experimental design involving quantitative measurement and some form of mathematical analysis is the only one that can be considered good science (Patton, 1980). For it is only these methods that can provide valid reliable and reasonable results in the

scientific tradition (Patton, 1990). Although the debates concerning research that does not use traditional scientific methods continue, the qualitative approaches have been increasingly accepted as serious scientific inquiry (Potter, 1996; Denzin and Lincoln, 1996; Yin, 1994).

However, there is a need to investigate phenomena and behaviors that do not lend themselves to traditional scientific inquiry. Whereas the hypothetico-deductive paradigm, which relies on quantitative methods, seeks to predict social phenomena, that Patton describes as the *holistic-inductive, anthropological* paradigm. This utilizes qualitative methods and is focused at understanding the phenomena (Patton, 1990). These methods are only now gaining acceptance by the larger scientific community. Patton (1990) listed ten strategic themes of qualitative inquiry. These themes can be used as indicators of the applicability of qualitative methods to particular research situations. Table 2 compares these themes to aspects of the current research.

In qualitative methods, measurement data is in the form of descriptions or narratives. The data is analyzed in its original form to protect its richness and depth. It deals with the thoughts, attitudes and beliefs of people and records them in their own terms (Patton, 1990). The use of multiple data collection techniques, as well as multiple sources of data, infuse rigor in the process through triangulation and serves to increase the validity of the results, making it more acceptable as serious scientific inquiry (Patton, 1990).

Qualitative methods have been challenged by proponents of more conventional scientific methods. In general, the criticism is in three areas.

Qualitative Research Themes	Explanation	How Applied to Current Research
Naturalistic Inquiry	Studying real world situations as they unfold naturally.	The systems studied are existing organizations and a similar approval process is used in many contextually similar situations.
Inductive Analysis	Explains open questions rather than listing deductive hypotheses.	Data was gathered to explore the approval process and determine critical relationships without pre-conceived hypothesis.
Holistic Perspective	The whole phenomena is understood as a complex system. Focus is on meaningful relationships not a few discrete variables.	Phenomena was studied as a sociotechnical system. STS assumes rich interrelationships between the subsystems. The system must be studied as a whole.
Qualitative Data	Detailed description and inquiry in depth. Direct contact capturing personal perspective and experience	Data was gathered by field notes and recording actual conversations, interviews and public meetings. Data analysis extracted complex concepts and themes from the raw data.

Table 2. Qualitative Methods Criteria

Qualitative Research Themes	Explanation	How Applied to Current Research
Personal Contact and Insight	Researcher has direct contact with the people and the phenomena. Researcher's personal experience and insight are important and critical to understanding the phenomena.	Researcher was a participant in the phenomena being studied. He interacted with all of the other participants. His professional role had a great deal of influence on the phenomena.
Dynamic Systems	Attention to process. Assumes change is ongoing whether the focus is on the individual or the system.	Research focused on the approval process. The system was constantly being influenced by the environment and the process was ongoing.
Unique case and Orientation	Assumes that each case is special and unique. Cross case analysis follows from and depends on the quality of the individual case study.	Basic premise of the case study method was used for the research. Research used multiple case study design. Each case was developed individually.

Table 2. (Continued)

Qualitative Research Themes	Explanation	How Applied to Current Research
Context Sensitivity	Place findings in social, historical and temporal context. Dubious of the possibility of generalization across time and space.	Another basic premise of the case study method. Results not generalizable but only evidence to support a larger theory.
Empathetic Neutrality	Complete objectivity is impossible. Pure subjectivity undermines credibility. Researcher includes personal experience as part of the relevant data while taking non-judgmental steps toward whatever content emerges.	Researcher was a participant in the in the phenomena and developed a personal relationship with many of the participants. By looking at the process rather than the results the researcher took a non-judgmental approach to the research although there was a professional interest in the approval process outcome.
Design Flexibility	Open to adapting inquiry as understanding deepens or situation changes.	Data was recorded as the events happened. Post decision interviews were held after the decision was complete. Interviews were conducted using an interview guide permitting in-depth exploration and probing based on interview progression.

Table 2. (Continued)

researcher influence, generalizability, and reproducibility. Qualitative methods with their reliance on non-numerical data and analysis based on interpretation and explanation are vulnerable to researcher bias. The researcher must be cognizant of potential bias issues while developing a research design and use procedures that mitigate its effects. However, qualitative research utilizes the researcher as its primary instrument. The researcher's "familiarity with the phenomena", "ability to draw on intuition and tacit knowledge", and his "insights ideas, and impressions [become] part of the data of the study and inform the process of data collection and analysis" (Whitt, 1991, 408). As Poplin (1987) points out, a primary distinction between qualitative and quantitative approach is how they view researcher influence. The quantitative tradition views researcher influence as something which should be minimized with a goal of total elimination. However the qualitative tradition accepts the inevitability of researcher influence and the inherent strength that influence can bring to the research.

Another criticism of qualitative methods is that the results are not generalizable beyond the local context where they were generated (Keating, 1993). The criticism is due, in part, to contrasting qualitative methods with quantitative methods where a sample, correctly chosen, can be shown to be statistically generalizable to a larger universe (Yin, 1994). In qualitative methods generalization is done by generalizing the results to a broader theory through multiple replications of similar studies (Yin, 1994).

Reproducibility is a common concern with all types of research. The issue of reproducibility for quantitative methods implies that another researcher can replicate an experiment and obtain the same results. The events and phenomena studied in qualitative research are unique and cannot be repeated. Reproducibility in terms of qualitative methods means that another researcher can analyze the study data using the same procedures and obtain the same results. Reproducibility in qualitative methods can be maintained by careful attention to detail in research design and data collection.

Patton (1980) also discusses the issues of intellectual rigor in qualitative research. He states that:

> The thread that runs through [the] procedures and techniques for verifying and validating qualitative data is their dependence on intellectual rigor of the evaluator. There are no clear-cut rules on how to proceed. The task is to do one's best to make sense out of things. A qualitative analyst returns to the data over and over again. To see if the constructs, categories, explanations, and interpretations make sense, if they really reflect the nature of the phenomena. Creativity, intellectual rigor, perseverance, insight— these are the intangibles that go beyond the routine application of scientific procedures [Patton, 1980, 339].

The differences between quantitative and qualitative inquiry can be summarized in their purpose, the role of the researcher and how they come to create knowledge. Quantitative research seeks to explain phenomena with the ultimate goal of learning to measure and understand it. Qualitative research is interested in understanding complex relationships in the phenomena being studied. Quantitative researches attempt to limit personal interpretation until all of the data has been gathered and analyzed. Qualitative research mandates

that the researchers make choices and judgments about the data and the subject while in the process of gathering data. Quantitative research seeks to construct knowledge from information structured by the bounds of the research design and the variables included in the analysis. Qualitative research discovers knowledge by including as many variables as possible in the interpretation of events (Stake, 1995).

The question of the research method to be used brings with it other issues with respect to the researcher and the phenomena being studied. Researchers in the physical sciences can make the assumption, with some degree of confidence, that the they can remain objective and that the subjects of research will remain relatively unaffected by the act of being studied. Researchers in the social sciences must assume that the researchers and their subjects are in a constant state of interaction. Furthermore, from an epistemological point of view, researchers in the social sciences, especially those using qualitative methods, cannot be considered truly objective (Potter, 1996). This is especially true in the research of this study since the researcher had a stake in the outcome of the process he was studying. In an attempt to mitigate bias on the part of the researcher, the research questions were structured to focus study on the approval process itself not on its outcome. Another way that the issue of researcher bias was addressed was through reflexive review of the results by the subjects.

From the ontological perspective, the methodology used and the resulting research design must allow that the phenomena cannot be studied without being

influenced. The subject's actions are not only influenced by the researcher in his research capacity but more importantly in his professional capacity. As a professional, the researcher had an active role in the system being studied. The phenomena being observed emerged and was constructed through the actions of the researcher in both his capacities. One way to address this issue is to assume that the researcher in this case would still influence the phenomena in his professional role whether or not the research was ongoing. This further assumes that his influence in his professional capacity greatly overshadowed his influence as a researcher. While this was not the subject of the study, it certainly respects the reflexive nature of the qualitative approach and the necessity to consider the researcher's role in the design.

Much of the above discussion with relation to qualitative methods in general apply when discussing more specific qualitative methods. The qualitative method chosen for this research is case study. A more detailed discussion of the case study method and its applicability to this research follows.

Case Study as a Qualitative Method

The previous discussion on qualitative and quantitative methods is background for a more detailed discussion of research methods in general and case study, in particular. There are numerous research strategies used in the study of social and behavioral phenomena. These include experimental strategies, survey research, archival analysis and history. Each strategy has situations where it is appropriately suited. The strategies can be classified by which types of research question they are best designed to answer, whether or

not they require control over the events being studied, and whether they focus on contemporary or historical events (Yin, 1994).

Case study is best suited when the research question requires the study to explain or explore complex events and relationships. The techniques used in data analysis and the written form of case narrative are flexible enough to deal with issues of context and relationships among individuals and groups required to answer these types of questions in social or behavioral research. Unlike other behavioral research strategies, case study does not require control over events in the phenomena being studied. The focus on case study normally involves contemporary events where there are a variety of data sources available. The case study method allows different data collection techniques to be used with specific data sources (Yin,1994). A comparison of qualitative methods criteria from Patton (1990) with the methods used in this research is shown in Table 2. The thrust of this comparison is to establish the appropriateness of the qualitative approach for this research effort.

Types of Case Study

One method to classify case studies is through the type of phenomena that is being studied. Yin (1994) identifies five primary classifications of the case study method: *Explanatory* case studies can be used to investigate the causal links in real life situations that may be too complex to be studied by more traditional strategies. *Descriptive* case studies describe the events of a case and especially their context. *Illustrative* case studies focus attention on certain elements of larger phenomena. *Exploratory* case studies are used to investigate

phenomena that do not have a clear set of outcomes and are often used as pilot studies to determine the best strategy for a more focused investigation. *Meta-evaluation* case studies investigate the outcome of other evaluations or interventions (Yin, 1994).

Case study, as a research method, has received very little serious attention by authors on social science research methods. When case study is discussed, it is usually as a preliminary stage or data collection technique used with other research methods that the authors consider more suited to the conduct of serious social or behavioral research (Isaac and Michael, 1981. Sjoberg, Williams, Vaughan and Sjoberg, 1991). In many instances discussion of the case study method is combined with other methods such as ethnography or participant observation. With regard to participant observation, it should be noted that in many instances, case study includes the use of participant observation as a data collection technique. However, the case study method has, from traditional research perspectives, been characterized as (1) limited to a few units and, therefore, narrow in focus, (2) lacking generalization beyond the specific context, and (3) subject to research bias (Isaac and Michael, 1981)

Yin (1994) and Stake (1995) have both published texts concentrating on case study as a serious research strategy. Yin especially has defined case study as a research method. He defines a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between the phenomenon and the context are not clearly evident" (Yin,1994, 13). He goes on to explain that case study is

useful as a serious research strategy when the context surrounding a phenomenon is vital to understanding the phenomenon itself. There are other strategies that can deal with context, but the case study is uniquely suited for studying context that is pertinent to the phenomenon. In order to consider case study as a research strategy itself, and not just a method supporting other strategies, Yin further clarifies the definition by describing some of the technical characteristics of a case study mode of inquiry. He states that the case study is of particular value in researching situations where there are many more variables than available data points (Yin, 1994). To handle this situation a case study must rely on multiple sources of evidence and triangulation for the data to converge (Stake, 1994; Yin, 1994). Because Yin is considering case study as a serious research strategy he notes that, as in all serious research, a rigorous case study should be based on a theoretical framework that is used to structure the data collection and analysis (Yin, 1994).

Another criteria for case study is based on the premise that a phenomenon that is being studied for its uniqueness can only be investigated using a case study strategy. The detailed study of a single bounded system must be a case study (Smith, 1979). In order to be studied a case must be an integrated system of working parts. By this definition, individuals, organizations and programs may be cases while their relationships and policies can not (Sjoberg, Williams, Vaughan and Sjoberg, 1991; Stake, 1994; Stake, 1995)

The method used in this research is best described as an exploratory case study because the research questions seek to explore the phenomena in

terms of relationships among the participants within a specific research framework (Orum, Feagin and Sjoberg, 1991; Yin, 1994). Since the results of the study are to include theoretical and practical implications for use beyond the immediate context, the research method could also be considered an instrumental case study (Stake, 1994; Stake, 1995).

Case Study as a Serious Research Strategy

As noted previously, case study is not a universally accepted strategy for serious scientific research (Orum, Feagin and Sjoberg, 1991; Yin, 1994). When comparing case study with more conventional research strategies, Yin (1994) comments that many authors have noted perceived weaknesses. Only recently have proponents of case study begun to respond.

The most commonly cited criticism of case studies is the suggested lack of rigor (Yin, 1994). Because case study often uses qualitative methods, a common criticism is that it is particularly vulnerable to bias on the part of the researcher (Orum, Feagin and Sjoberg, 1991; Yin, 1994). Also, qualitative methods in general can be prone to the influence of equivocal evidence (Yin, 1994). Lack of research rigor, researcher bias, and equivocal evidence are actually more appropriate criticisms of the researcher not the strategy used. Rigorous research design, disciplined inquiry and diligence on the part of the researcher can overcome these suggested weakness just as it does with other research strategies.

It is also pointed out that the study of a single case fails to provide sufficient basis for scientific generalization. Again, this can be true of other

research strategies where the research design is based on a single experiment. Like these other strategies, case study is generalizable in that it adds to the weight of evidence supporting or conflicting with theoretical propositions. It is not in and of itself sufficient for statistical inference (Yin, 1994).

In general the criticisms of case study are not without merit. In the past many case studies have lacked rigor in design or have been performed haphazardly which has spread doubt about the validity of all case study research. Also, there is some confusion between case histories, which are written as instructional stories, and serious case studies that are designed as research.

The approach to overcome many if not all of the potential weaknesses of a research project utilizing case study, or any other method for that matter, is to start by developing a rigorous research design. Unlike more conventional research strategies, there has not been a sufficient number of rigorous case study research projects to develop a series of successful designs that can be emulated (Yin, 1994). The case study method has been confused with or only considered a component of other research strategies (Sjoberg, Williams, Vaughan and Sjoberg, 1991; Yin, 1994). Lately, however, authors such as Yin (1994) and Stake (1995) have begun to treat case study itself as a serious research method.

Yin (1994) defines the research design as the steps that need to be taken to progress from the initial research questions to the answers or conclusion. He mentions five components of design that need to be addressed for case study

These components include: (1) research questions,(2) propositions, (3) units of analysis, (4) the logical link between the data and the propositions, and (5) criteria for interpreting the findings. The researcher must carefully develop the research questions before choosing an appropriate research strategy.

The study propositions connect the research questions to theoretical issues. This step in the design focuses the research on the collection and analysis of data that is relevant to answering the research questions. This is important to ensure the validity of the research.

The unit of analysis as defined by Yin (1994) defines the boundaries of the case study. Stake (1995) uses the term *case* in place of unit of analysis. The appropriate unit of analysis is determined by both the research questions and the study propositions (Sjoberg, Williams, Vaughan and Sjoberg, 1991. Stake, 1994; Stake, 1995). The unit of analysis can be as small as a single individual or as large as a whole organization (Yin, 1994). Yin also includes organizational change and processes as a possible units of analysis. This appears to be in conflict with Stake, who implies that individuals or groups of individuals can be cases but not relationships or interactions between them (Stake, 1995). The selection of the unit of analysis must include consideration of the individuals to be specifically included and those who will be specifically excluded. If the case is in an organization setting determining the individuals to include in the unit of analysis may be a simple task. However, if the unit of analysis is more nebulous, such as a neighborhood, the process of determining the appropriate unit of analysis will be a major undertaking. For this research

considerations choosing the unit of analysis included similarities such as: (1) governmental structure, (2) the fact that both towns owned water and wastewater facilities that served their entire populations, (3) and that both were considering the same proposal under similar circumstances. However, the towns also had significant differences as: (1) their populations, (2) the range of public services they provide, and (3) the extent of economic development. These factors caused an increase in the study's depth.

Another dimension of the unit of analysis that must be considered is the time frame. This determines the limits of the data collection effort. In some case studies the time frame is set by the initiation and conclusion of a particular set of events. For ongoing phenomena the researchers are forced to set time boundaries for the research that they feel can expose the particular behaviors or relationships to adequate study.

The research design should include a method to analyze the data then link the results to the theoretical propositions (Yin, 1994). There is very little case study literature that sheds light on this subject. Many case studies have relied on pattern matching as a data analysis technique. Other analysis techniques that have been used in case study include explanation-building and time series analysis. However, for case study research based on a specific theoretical framework there may be methods that are generally recognized as appropriate for research using that framework.

To provide rigor and aid in the research design, Yin (1994) recommends that theory development be included in the research design effort. This is

consistent with other authors' (Maxwell, 1995; Marshall and Rossman, 1995, Miles and Huberman, 1994) recognition of the role of theory as a foundation for conducting qualitative research. The best course would be to use an existing theoretical framework from literature, if possible, rather than spend the large amount of time required to develop new theory. Articulation of the theoretical basis in the early stages of the research design guides the data collection. A sound theoretical framework will also become the basis for generalization of the case study results (Yin, 1994).

Case study research, as other forms of qualitative research, must stand up to the same standards of validity as other strategies to be considered a method for doing rigorous investigation (Orum, Feagin, and Sjoberg, 1991; Yin, 1994). Criteria for validity normally used to determine the quality of research designs include construct validity, internal validity, external validity, and reliability. However, qualitative research is not quantitative research and a direct comparison between the two is inappropriate.

Strass and Corbin (1990) note that:

> ... The usual cannons of 'good science' should be retained but require redefinition in order to fit the realities of qualitative research and the complexities of social phenomenon that we seek to understand [Strass and Corbin, 1990, 250].

One criticism of case study research is that the data collection techniques are considered subjective. Has sufficient attention been paid to whether the measures used and the data collected actually describe the phenomenon being studied or, are they merely a reflection of the investigator's subjective judgment?

Three tactics are available to ensure construct validity in case studies. First, using multiple sources of evidence enhances validity by providing data triangulation. Second, maintaining a solid chain of conclusive evidence provide for consistency in conclusion (Stake, 1994; Yin, 1994; Stake, 1995). Both multiple sources and chain of evidence increase construct validity by ensuring that the conclusions drawn can be definitively supported from evidence in the data base. A third tactic is to have some of the subjects of the case review the case draft for accuracy (Yin, 1994). This adds support for the accuracy of the case study constructed from the data.

Internal validity is only an issue for explanatory case studies where the object is to determine if a certain phenomenon is caused by a particular variable A possible threat to internal validity is that another variable, that has not yet come to light, is the actual cause of the phenomenon. Another possible internal validity problem occurs when the researcher must infer that a particular event occurred based on previous events. The internal validity issue is addressed in the data analysis phase. The data must be analyzed in systematic fashion to ensure that rival explanations can be ruled out (Yin, 1994).

External validity is harder to achieve in case studies since it deals with generalizing the case study findings. Many of the criticisms of the case study strategy stem from problems of generalization. As stated earlier the aim of generalization in case study is analytical generalization where the goal is to generalize the case study results to a larger theory. In a sense, a single case study is analogous to a single experiment that provides evidence to support or

refute a theory. Replication logic through a multiple case study technique can be used to increase the weight of evidence for or against a theory (Yin, 1994). The arguments made by Yin attempt to modify the generally accepted notions of external validity and generalization to better suit qualitative research in general and case study in particular. Patton (1986) takes another approach to discuss validity by noting that generalizability in qualitative research might better be explained in terms of what he calls 'reasonable extrapolation'. He states.

> Unlike the usual meaning of the term 'generalization', an extrapolation clearly connotes that one has gone beyond the narrow confines of the data to think about other applications of the findings. Extrapolations are modest speculations on the likely applicability to other situations under similar, but not identical, conditions. Extrapolations are logical, thoughtful, and problem-oriented rather than purely empirical, statistical and probabilistic [Patton, 1986, 7].

The primary concern of reliability is to be sure that given the same data and the same procedures the results of the case study will be the same. The ultimate goal is to remove bias from the study results. Yin notes that in case study research the issue of reliability can only apply to a specific case. The method for ensuring reliability is to fully document data and procedures used to analyze the data. In that way another researcher, using the same data base and the same procedures, should develop the same results (Yin, 1994). This is consistent with Sandelowski's (1986) notion of auditability.

Again, Yin (1994) is attempting to modify a generally accepted notion, in this instance reliability, to suit case study. Authors have questioned if the concept of reliability is applicable to qualitative research designs (Orum, Feagin and Sjoberg, 1991; Yin, 1994). Other authors have advocated the use of

another concept, termed auditability as being the qualitative counterpart to reliability in quantitative research (Guba and Lincoln, 1981). Sandelowski defined the concept of auditablity by saying:

> A study and its findings are auditable when another researcher can clearly follow the ' decision trail' used by the investigator in the study In addition, another researcher could arrive at the same or comparable, but not contradictory, conclusions given the researcher's data, perspective and situation. [Sandelowski, 1986, 33]

The common theme in all of the discussion on reliability in qualitative research, and therefore case study research, is that while it is not possible to ensure complete reliability, it can be enhanced by designing it such that the readers can precisely follow the research (Keating, 1993).

Stake (1995) mentions another type of validity termed consequential validity by Messick (1989). This deals with the ethics surrounding the use of the measurements and results of the case study. He posits that the researcher is responsible for the consequences of the results of the study being used by others if those results can not be shown to be valid. He goes on to say that the researcher has an ethical responsibility to minimize misrepresentations and misunderstanding resulting from his work (Stake, 1995)

Case Study Design

Case study designs can be either single or multiple. Within each of those the studies can be conducted as either holistic or embedded investigations The single case study can be used when it is robust enough to represent a critical case in testing a theory. In this role the single case is analogous to a single experiment. In that instance the case results can further support the theory's

propositions, or it can show evidence that some other rival theory may be applicable. A single case study is also appropriate when the case being studied is extreme or unique if there is chance that a similar case will appear within the study time frame to be included in a multiple study. In a similar situation there may be a single case that is the only one available to study a particular phenomenon. In that instance it would be justified to study the case in hopes that a similar case would occur in the future which could be used as a replication (Yin, 1994).

A risk in using a single case study design is that while performing the study, the researcher may find out that the case is different than it first appeared Thorough investigation of the circumstances surrounding the case should be done during the design phase to eliminate the need to abandon the research in later stages or to redesign it (Yin, 1994).

A single case study can be designed with only one unit of analysis, holistic, or it can have multiple units of analysis, embedded. The holistic design focuses attention on the entire case and not on components of it (Orum, Feagin, and Sjoberg, 1991). It is applicable when there are no significant sub units or when studying the sub units would distract the researcher from the research questions that have to do with the case as a whole. If the theoretical framework for the study is holistic in nature then a holistic study is indicated. Holistic designs have some of the same disadvantages as single case studies in general. One concern is that the global nature of a holistic design may not allow the researcher to focus on specific details in the case that could be important

Another is that a holistic design tends to be abstract without hard measurement or data. This opens the case study up to many of the common criticisms. And, like the single case study, the focus may shift during the course of the study without the researcher necessarily realizing it (Yin, 1994).

If there are logical sub units that can be studied within a case, then an embedded design may be used. Examples of appropriate sub units are individual projects within a larger program that is being studied or individual decisions made by an organization that is being studied. Studying sub units can have the effect of focusing the study on particular aspects. However, there is a danger that the study can get stuck at the sub unit level (Yin, 1994).

Some case studies can take advantage of a multiple case design. A multiple case design is in reality a series of individual cases. The individual cases can either be holistic or embedded; however, the two designs should not be mixed within one study. The advantage of a multiple study is that, in general, the evidence from a multiple case study does not suffer some of the weaknesses of the single case design. Multiple case designs are less likely to be criticized due to problems with external validity.

The cases for a multiple case study must be selected to follow some replication logic. Literal replication logic can be used when the cases are chosen because they are expected to produce similar results. If the cases are expected to produce conflicting results, then theoretical replication logic is used. The replication logic chosen must be in concert with the theoretical framework

on which the overall research is based If the results of the study are not predicted by the framework then the framework must be modified (Yin, 1994)

Stake takes what Yin calls a single case study and breaks it down further He defines the study of a critical or unique case as an intrinsic case study A single case study that will yield results that can be generalized within a larger framework, he calls an instrumental case study The multiple case strategy, he terms a collective case study (Stake, 1994, Stake, 1995)

Summary

The discussions in this chapter were designed to the methodological basis for the research design It included discussions of qualitative methods, and more specifically case study, as to their applicability to this study Throughout, issues were raised concerning the controversy over qualitative methods as suitable for serious research It concludes that qualitative methods cannot be judged by criteria that were originally designed for quantitative methods The criteria used to judge the quality of a qualitative research design must take into account the unique nature of these methods and the phenomena to which they are applied In some cases the quality criteria can be modified to suit In others, new quality criteria must be established that address the same quality concerns, but do so by taking into account the nature of the qualitative methods being used and the specific goals of the research

CHAPTER IV

RESEARCH DESIGN

Introduction

This chapter develops the research design based on the methodological foundation of the previous chapter. It addresses design issues and includes discussions of characteristics of the cases themselves, time boundaries, stakeholder issues, as well as issues of validity and reliability. It then addresses more specific aspects of the design such as data sources, the appropriateness of the data and relationship of the data to the case study objective Following those are discussions on data analysis, the case study data base, case narratives, case verification, cross case analysis and interpretation of the results.

The purpose of the study was to apply sociotechnical systems theory to explore the process used by two elected bodies to decide on the adoption of a complex technical engineering proposal. The case study method is appropriate because it can deal with complex relationships among variables that may not be amenable to a quantitative method such as those found in the political environment (Yin, 1994). The research questions deal with the implications of the research on the utility of sociotechnical systems theory, methods for a broader range of systems and the practical uses of sociotechnical systems as a conceptual framework to conduct a case study. The research questions explore the implications the results have for engineers and other experts when working

with elected officials on complex decisions. The study also considered questions concerning the use of sociotechnical systems as a research framework.

The first research question was: can a sociotechnical systems based conceptual framework be applied to explore the evaluation process of technical engineering proposals in a political setting? The conceptual framework was applied to a nontraditional setting with respect to sociotechnical systems theory Traditionally, conceptual frameworks based on sociotechnical systems theory have commonly been applied to systems with linear transformation processes such as in manufacturing. In this instance a conceptual framework based on sociotechnical systems theory was applied in a nontraditional setting which used nonlinear transformation processes. The sociotechnical systems based conceptual framework was used only as an analysis method rather than in its more conventional role of analysis to be followed by work design or redesign.

The second question was: what implications can be drawn from using sociotechnical systems theory to explore a complex process in a nontraditional setting? The results of the research developed implications for a sociotechnical systems conceptual framework used as a method for analysis of extremely non-linear systems. In conventional settings, sociotechnical systems conceptual frameworks have been used as intervention strategies involving both analysis and work design. The research developed implications for using the results of a sociotechnical systems based analysis of a political evaluation process for the practice of engineering management.

This study also explored using a sociotechnical systems conceptual framework in case study research. Lack of rigor has been a criticism of case study methods, and the use of a rigorous theoretical framework in the development of the research design is a recommended technique to infuse rigor into case study methods (Yin, 1994). The research developed implications for the use of sociotechnical systems based conceptual frameworks in case studies.

The Sociotechnical Systems Framework for the Study

The sociotechnical systems framework provided the theoretical base for the construction of a framework for the study. Pava (1983) extended the sociotechnical system conceptual framework that was used in traditional settings for use with non-routine office work characterized by nonlinear transformation processes. This research extends the use of sociotechnical systems theory into the political environment which is a non-traditional setting characterized by extreme non-linearity. The conceptual framework for this research was adapted from the work of Pava (1983) on non-routine office systems which extended sociotechnical systems into nontraditional areas. Originally designed around system with more or less linear transformation processes, Pava has modified the traditional sociotechnical system framework for use with systems that have nonlinear transformation processes, such as what he terms non-routine office work.

The researcher made further interpretations to the analysis phases of Pava's (1983) sociotechnical systems framework for non-routine office systems These interpretations were necessary to make the framework more suitable for

use as a data analysis method for case studies involving the decision process in an elected governmental body of a small town. The interpretations entailed further elaboration of the concepts used by Pava (1983) in the technical subsystem analysis. These elaborations included: (1) the elected body decision process and (2) deliberations in the system. The decision process of an elected body was depicted as a process by which information, in the form of a topic, was evaluated in relation to issues to reach a consensus on the merits of the topic with respect to the town. Issues were identified as value laden concepts such as the effect of the topic on taxes or the quality of town life. Elected bodies have standing issues, such as taxes or the quality of town life that almost all topics are evaluated against. There are also topic specific issues such as the effect of a public works proposal on sewer rates. Some issues emerge during the deliberations or are inserted into the deliberations by influence from the environment. (see Figure 7)

During deliberations issues can be resolved or remain unresolved with respect to the topic. A resolved issue is one in which the elected body can reach a consensus about the topic with respect to that issue. If the body cannot reach a consensus on the topic with respect to the issue, then it remains unresolved and becomes a source of confusion. The issue may or may not be directly related to the topic. However, if the issue is introduced during the deliberations it must be included in the deliberations regardless of its final disposition with respect to the topic. As in the Pava (1983) framework, the cause of variance, or in these cases confusion, is primarily gaps in the

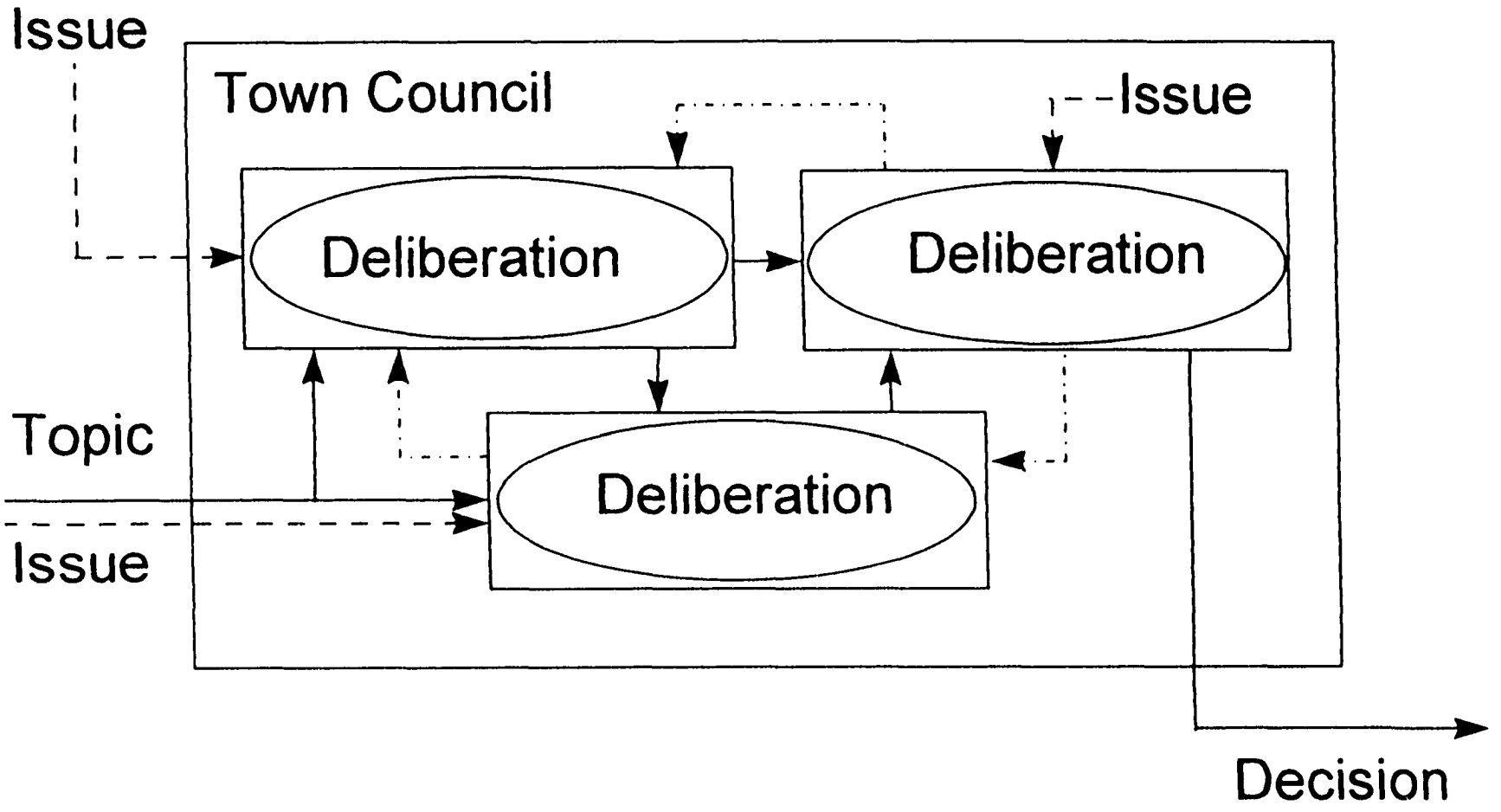

Figure 7. Research Conceptual Framework

information required for deliberations. The gaps may be caused by lack of information or information that is not in a format the body members can understand. The elected body can make a decision based on the outcomes of deliberations on issues that were resolved. If important issues are left unresolved, the elected body cannot reach a decision on the topic.

Research Method

The case study method was chosen for this research because it is suited to explore the approval process being studied with regard to the research questions. This research explores the functioning of a decision process in an elected body through analysis using a sociotechnical systems framework. It focuses on contemporary events in which there were multiple sources of data. The flexibility of the case study method is appropriate for situations when there are multiple data sources because it allows for the use of different data collection techniques. The data analysis techniques and the written form of the final case narrative are not constrained and can deal with context laden subjects and the complex relationships between the elected body and its environment as well as among the participants. Case study research is also appropriate when the researcher has no control over the events being studied (Yin, 1994). In this instance, the elected body being studied was involved in an ongoing decision process. The primary data gathered was the recording of events and discussions as they happened. See Figure 8 for a graphical representation of the research design. There were six phases of the research including:

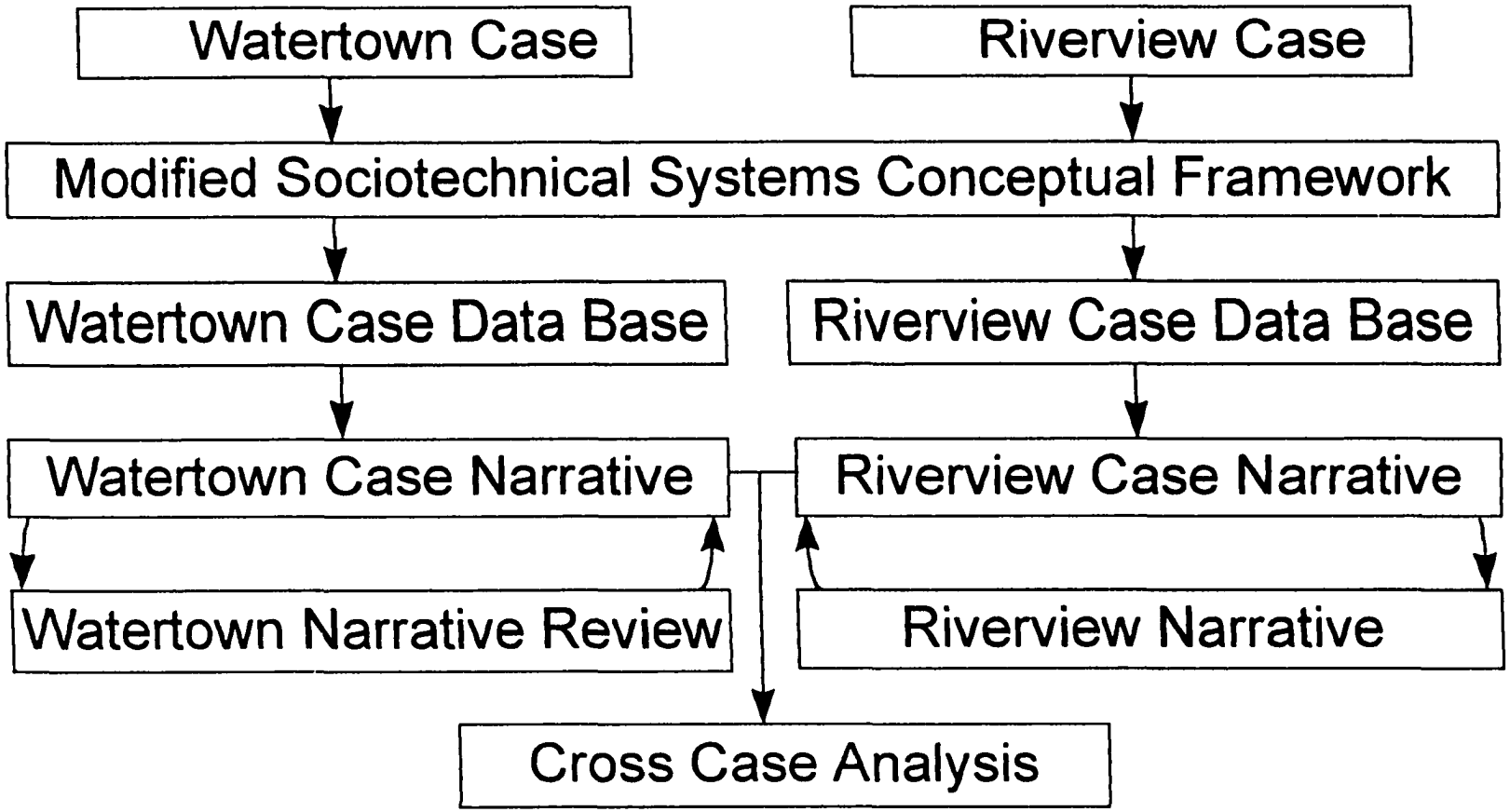

Figure 8. Research Design

(1) selection of the cases, (2) data collection during the cases, (3) construction of the case study data bases using the modified sociotechnical systems conceptual framework, (4) drafting the case study narratives using evidence from the case study data bases, (5) verification of the accuracy of the case narratives by selected participants, and (6) cross case analysis.

Case Selection

The unit of analysis chosen for this research was a multiple case study of two towns that were involved in individual approval processes concerning approval of the same public works proposal. Factors that supported their selection as cases were that the towns had similar governmental structures, and the researcher had access to their deliberations through his professional role. Another factor was that, unlike the other localities that were considering the proposal, they both had existing wastewater facilities that served their entire populations. The proposal called for them to turn the facilities over to the metropolitan public utility. There were differences between the towns in terms of size and extent of economic development. It was expected that their differences would increase the number and types of issues deliberated during the research; and therefore, strengthen the external validity of the research. There was a third town with a similar governmental structure that could have provided another case replication to further strengthen external validity but their deliberations were extremely brief and not available to the researcher for data gathering purposes.

There were some council members in one of the localities studied who were concerned about being mentioned by name in the case study. Since their roles in the deliberations would also be analyzed, persons reading the name of the town in the case narrative would also be able to deduce the identity of some of the council members. For that reason it was decided to use fictitious names for the town and speak of the council members by their title but not by name. The names were given as Riverview for the larger town and Watertown for the smaller.

The towns selected differ in size. Watertown, has a population of approximately six hundred. It relies on the surrounding county and the state to provide many of its services such as schools, police and street repair. It relies on a regional agency for solid waste collection and disposal. It does, however, provide its own water and wastewater services. It has a very small town staff of four people including the town manager. The town manager, in addition to being an administrator, also is called upon to perform hands on public works tasks in the field from time to time. The town is compact enough that everything is within easy walking distance. The town has a main street commercial district which is centrally located. The largest businesses in town consist of several marinas. A weekly newspaper is published in the town.

Riverview, has a population of approximately three thousand. It provides almost all of the necessary governmental services itself except for street repair which is handled by a state agency. It has a large town staff and the town manager performs mainly management and administrative functions. There is

an large industry in town that provides employment for a many of the town's citizens. There is also a main street commercial district as well as a shopping center. It also has a weekly newspaper published in town.

Data Collection

In general data collection for the case study consisted of the recording of events, conversations, and deliberations that were ongoing during the decision process. (see Table 3) There was also a limited amount of material reported by local print journalists. Although the researcher was an active participant in many of the discussions, he had little control over the course of these discussions and, therefore the amount and type of the data produced. Qualitative methods in general and the case study method in particular lend themselves to this type of research situation.

The researcher took notes on events throughout the project. These included notes on telephone conversations that took place between the researcher and the town managers. There were also notes on conversations with some of the council members which were held in informal settings The notes consisted of brief narratives on the participants in the conversation and the highlights of the discussions, including any significant points that were made They were recorded in order on loose leaf paper which was dated and filed chronologically in a three ring binder which served as a project journal.

Watertown provided easy access for data gathering. The town manager was willing to discuss all of the issues freely. He also set up three private meetings between the council members and the researcher. These meetings

Date	Watertown Case	Riverview Case
February 27, 1996	Metropolitan Public Utility Approves Feasibility Study Report Distribution	
March 27, 1996	Presentation at the Regional Planning Agency Dinner Meeting	
April 3, 1996	Small Group Session With Two Watertown Council Members	
April 16,1996	Public Information Session in a Neighboring Locality	
May 2, 1996	Small Group Session With Two Watertown Council Members	
May 7, 1996	Watertown and Riverview Mayoral and Town Council Elections	
May 16, 1996		Riverview Town Council Work Session Concerning the Topic

Table 3. Chronology of Major Case Events

Date	Watertown Case	Riverview Case
May 17, 1996	Small Group Session With Two Watertown Council Members	
May 20, 1996	Watertown Town Council Meeting With Public Comment Period	
June 17,1996	Watertown Town Council Meeting Vote Taken to Decide on Topic	
July 27, 1996		Riverview Town Council Second Work Session Concerning the Topic
September 4, 1996		RiverviewTown Council Meeting Vote Taken to Decide on Topic

Table 3 . (Continued)

were held in informal locations and were scheduled at the convenience of the council members. One of the meetings was held in a local restaurant during lunch hour. The others were held in the town's council chambers on evenings when it was not in use for official functions. Each meeting consisted of the researcher in his role as project manager and two council members. They began with a briefing on the proposal by the project manager. The council members were allowed to interrupt with questions during the briefing. Following the briefing, the council members and the project manager engaged in a general discussion concerning the proposal. The council members were advised in advance that the meetings were being tape recorded for research purposes. The researcher also made notes in the project journal as to the issues discussed and the behavior of the council members during the meetings.

Watertown included the proposal on the agenda for two of the regularly scheduled town council meetings. For the first meeting the agenda noted the topic would be discussed during a public comment period. There were no citizens in attendance by the time the topic came up. The time was used for general deliberations on the issues by the council members and council members asked questions of the town manager and the project manager in order to clarify some issues. This session was tape recorded by both the researcher for research purposes and by the town manager as an official record of the meeting. For the second meeting the agenda noted that the topic would also be discussed during a public comment period which would then be followed by a vote on a motion to send a letter to the regional wastewater agency committing

the town to the proposal. There were discussions and deliberations among the council members, the town manager, the project manager and a few citizens during the public comment period. This was followed by a vote approving the motion to send the letter. As with the first council meeting the proceedings were recorded by both the researcher and the town manager.

Following their decision, three of the council members and the mayor were asked to be interviewed concerning their impressions of the process. They were selected by the researcher with input from the town manager based on their interest in the research and their availability. The interviews were conducted separately in informal settings using an interview guide to structure the discussion. (see Appendix 5) The interviews were tape recorded.

There were two informational public forums during which the researcher was asked to give presentations in his role as project manager. One was an advertised public information session held in the school auditorium of a neighboring locality. The project manager gave a presentation which was followed by a question and answer period. A town council member from the smaller town and its town manager were in attendance and asked questions. The entire session was tape recorded. Another informational public forum was a dinner meeting held by the regional planning agency. All of the elected officials from the localities in the in the area were invited to attend. Both of the towns in the study were represented by several of their council members, their mayors and their town managers. The researcher in his role as project manager was the topic speaker for the evening. The project manager was joined by three upper

management officials from his agency. The project manager's presentation was followed by a question and answer period in which officials from all of the localities participated. The presentation and the question and answer period were tape recorded. The researcher made some notations on discussions that occurred during a pre-dinner cocktail hour.

In Riverview, access to the proposal approval process was not as complete. The town manager was not willing to set up briefing sessions with the council members. The town manager set up two work sessions for town council to discuss the proposal. The first was held just prior to the election. The mayor and three of the seven council members were not in attendance. The project manager was asked to give a presentation on the proposal which was followed by a discussion of the proposal by council members, the town manager and the project manager. Although the work session was technically open to the public there were no citizens or representatives of the media present. The council members were advised that the proceedings were being recorded for research purposes.

The second work session was held after the election and included two new council members along with those who were reelected, the town manager and the project manager. The format was the same as the first session. Again, there were no citizens in attendance and the session was tape recorded. Although the public sessions were open for the researcher to attend, some of the deliberations were held in private sessions where the researcher was not invited. However, there was one public session that the mayor felt the

researcher should not attend. During that meeting the council adjourned to deliberate in closed session, reconvened in open session and quickly voted to halt consideration of the proposal. This is the one instance that the researcher's being a participant affected the data gathering efforts. Data from this session was in the form of the meeting minutes and notes from a discussion with the mayor after the meeting.

Four council members in the larger town along with the mayor agreed to be interviewed after the decision on the proposal. The interviews were held using the same format and interview guide as those in Watertown. For Riverview, however, the mayor suggested which council members to interview He suggested that the researcher interview members who voted on both sides of the motion to halt consideration. The researcher and the mayor also agreed that the two new council members who were not involved during the entire process not be interviewed. This left the mayor, who did not vote because there was no tie to break, two council members on one side of the motion and two on the other.

There were some articles on the topic published by the press. The newspaper in Watertown gave the topic extensive coverage. Riverview's paper gave it very little coverage. There was some coverage in the major metropolitan paper from outside the area. Articles were photocopied for easier handling and filed in chronological order.

Much of the data was extracted from events that were ongoing during the decision process. The researcher was a participant in many of these events in

his role as project manager. In many cases his participation was an integral part of the event and was not connected with the data gathering process. His participation would have happened despite the data gathering effort.

Case Characteristics

Given the same sources of information and the same governmental structure, the two town councils came to different decisions for different reasons. This provided an opportunity to study why the deliberations came to different outcomes using multiple case logic in what Pava (1983) calls a theoretical replication which explains the contrasting result in terms of predictable reasons.

Each case was being studied holistically. The study focused on the council as the system to be analyzed using the modified sociotechnical framework as the analysis method. Detailed analysis was done on the environment, technical subsystem and the social subsystem levels in order to develop a clear picture of the entire system. The system is described through the relationships between the subsystems and the relationships between the subsystems and the environment. The case study method is particularly useful to study the relationship of the environment, which is usually termed context in case study nomenclature, with the other subsystems (Stake, 1995).

The relationships among the subsystems determine the nature of the individual deliberations. This, in turn, affected the final output of the system.

Researcher Issues

An issue that comes into question in terms of overall reliability of the study is the objectivity of the researcher. In this instance the researcher was

also an active participant in the events being studied. The researcher was the project manager for a governmental entity which would establish the regional wastewater treatment agency that was the topic of the decision. The initial information presented to the towns was a feasibility study report that was drafted by the project manager. The project manager interfaced with the town managers throughout the initial feasibility study and the decision process. At many of the public meetings the project manager was asked to give presentations, and during the decision process, he was asked to clarify issues under deliberation. He is recognized as an expert in many of the technical issues that were deliberated. Much of the data came from both public and private meetings where the project manager was present.

Although the researcher was acting as a representative of a large governmental agency that was officially neutral on the outcome of the decision, the project manager would eventually be put in charge of the regional agency if it was formed. Therefore, he had an interest in influencing the town councils to decide in favor of the proposal.

The research design attempts to mitigate the affects of the researcher's participation by concentrating on the decision process rather than the outcome. Although the researcher as project manager had influence over the information presented to the town councils, he had no influence over the decision process itself of which is governed by established rules and procedures. The specific decision processes used in these cases was determined by the town managers

and the councils based on how they have handled similar technical topics in the past.

Many of the town council members in small communities such as these do not have the background or technical expertise to deal with technical topics. They often rely on outside experts or consultants to aid their deliberations by clarifying some of the issues. The project managers participation would have taken place whether or not he was also in the role of researcher. Data was gathered during the public and private meetings by tape recording the proceedings. In the case of the public meetings the proceedings were also routinely tape recorded by the town managers to produce official records of the meetings.

Time Boundaries

The time frame for the case study was limited to the actual approval process. Data gathering began when the contents of the feasibility study report were first made available to the town council members. Active data gathering stopped immediately after the decisions were made through an official vote of the town councils except for selected private post decision interviews and case narrative reviews.

There was a danger that the discussion during the post decision interviews would include mention of issues that came up after the votes were taken. Interview guides were used to restrict the interviews to topics within the study time frame. The interview guide was developed to encourage only discussion of the deliberation process on issues during the approval process.

The interviewees were allowed to move the discussion to topics outside the time frame only after the data recording ceased and the tape recorder turned off. The interviewees were then told that the researcher was resuming his role as project manager.

Stakeholder Issues

The decisions being made will ultimately affect the entire populations of both towns and neighboring localities. Therefore, stakeholders can be found at all levels in the system and the environment. The researcher is also a stakeholder since, as noted above, he had an interest in the outcome of the decisions. He was also a resident of one of the neighboring localities. Many of the stakeholders were in the contextual environment and made their views known during deliberations, especially in the public forums. The most important stakeholders were the council members themselves since they would be affected by the decision personally and politically.

The post decision interviews were, in part, an attempt to capture the views of different factions among the town councils. Not all of the council members were available to be interviewed. In Watertown, the town manager was enlisted to help in selecting council members to interview that would represent a cross section of views. He actually went so far as to set up the interviews. In Riverview, the mayor made suggestions on whom to interview.

Validity and Reliability

To ensure that the research design produces a quality product the design must meet four generally accepted criteria. They are: construct validity, internal

validity, external validity and reliability. Attention was given in each phase of the research to meeting these criteria.

Construct validity is generally defined as "using the correct operational measures for the concepts being studied" (Yin, 1994, 33). This was addressed in the research design in three ways. The first was to use multiple sources of evidence by gathering data from various sources. These included the project notes and the tape recorded public meetings along with their official minutes and the tape recorded private briefings and interviews. Multiple data points were used to support the concepts expressed in the case study narrative and later cross case analysis. The supporting evidence items from the case study data base for each theme or issue were noted during the data analysis. Only themes or issues that could be supported by multiple evidence items were considered relevant. Secondly, stakeholders in each case were asked to review the draft case narrative and comment upon its accuracy. In Watertown, the town manager, the mayor and a council member volunteered to review the draft of the case narrative. In Riverview the mayor and two council members volunteered to review the draft of the case narrative. The case narratives were revised based on the reviewer's comments. Finally, a chain of evidence was maintained throughout the data analysis so that the evidence could be systematically advanced through the analysis steps. This was done by introducing a method of coding evidence items and their corresponding participant in the case study data base so that they could be referred to from any point in the data analysis. (see Appendices 6 and 7)

Internal validity is defined as "establishing a causal relationship whereby certain conditions are known to lead to other conditions, as distinguished from spurious relationships" (Yin, 1994, 33). This was accomplished through triangulation by using multiple sources of evidence when developing each theme in the case narratives. The triangulation effort was greatly aided by the chain of evidence that was maintained. In theme development the researcher could refer to multiple items in the case study data base to support the accuracy of the themes.

External validity, "establishing the domain to which the study's findings can be generalized" (Yin, 1994, 33), is an area in which many have criticized the case study method. Case study cannot rely on statistical generalization to ensure external validity. In case study the research design uses analytic generalization to apply those individual case study results to a larger theory. The findings do not support the theory within a statistical certainty but only add evidence that the theory is valid. Similar case study results add to the strength of the evidence. Multiple case study design, such as this one, enhance external validity through a form of replication logic similar to that used in experimental design to generalize multiple experiments (Yin, 1994) This research is a multiple case design but has only two replications. It can only add a limited amount of evidence to support the theoretical propositions on which it was based. The case study results are not readily generalizable beyond the context of the cases themselves. However, the research was designed to investigate processes that commonly take place in other elected bodies As further

research of the same type is performed on similar elected bodies, and those results are considered with the results from this research, the domain of generalization will expand.

Reliability , "demonstrating that the operations of the study can be repeated with the same results" (Yin, 1994, 33), is enhanced in case study by being sure that, given the exact same case, the case study, if repeated, will yield the same results. This can only be done if the case study is repeated using the same evidence and the same analysis procedures. Therefore, enhancing the reliability of a case study entails making sure that another researcher can follow the same procedures and has access to the same evidence. In this case study reliability was enhanced by developing a case study data base with procedures to ensure a chain of evidence and constructing a case study data base from which evidence was extracted (Yin, 1994). More specifically, the coding system provides the ability to follow individual items of evidence back through the analysis to the raw data. In the case narrative development notes, major themes and issues have the item numbers of their corresponding evidence items from the case study data base recorded with them. Evidence items in the case study data base have code numbers recorded with them that reference where in the raw data set they were found. Another researcher could, given the case study data and the raw data, perform the same analysis.

Appropriateness of the Data

The researcher had very little control over the events during the decision process itself. They proceeded according to the agendas developed by the town

managers and the rules which govern the conduct of council business. Each manager had developed his own plan for how the decision process was going to proceed. Data gathered from events over which the researcher has little or no control over are appropriate for use in the case study method (Yin, 1994).

The case study data existed in many different forms. It was usable because, unlike data for quantitative methods that are individual data points to be compared among each other, case study data is used in the form of evidence that is used to support a position. In case study, evidence in different forms and from different sources supports construct validity through the use of triangulation (Stake, 1994; Yin, 1994; Stake, 1995).

Relationship of the Data to the Case Study Objective

The data is evidence of the deliberations that took place on issues in the decision process. In the modified sociotechnical systems framework being used to analyze the data, deliberations on the input information with respect to issues is analogous to a conversion or transformation process in a conventional sociotechnical system. The final decision or output results from consensus on the outcomes of the individual deliberations. The objective of the case studies is to provide an accurate depiction of the processes, as well as events and context that surround them.

The data consists of the project notes, audio tapes, meeting minutes and articles that were generated from the conversations and events that comprised the cases. Categories were developed from the modified sociotechnical systems framework to reduce and classify the data. The data was classified with respect

to the phases of sociotechnical systems analysis which are, the environment scan, technical subsystem analysis and the social subsystem analysis. The classified data comprised the case study data bases. The case study data bases were reviewed for themes and issues that, when compiled into narrative form, would result in accurate depiction of the cases and their context. Individual items in the case study data bases were used as supporting evidence for the themes and issues in the case narratives. (see Figure 9)

Data Analysis Using the Modified Sociotechnical Systems Framework

The framework used for the data analysis is based on the one Pava developed for sociotechnical design of what he termed non-routine office work systems (Pava, 1983). These systems were characterized by non-linear transformations of input information to output policies or decisions through the use of deliberations. The Pava framework was interpreted to be useful as a method to analyze a decision process in an elected body through further definition and development of the concept of deliberation.

The procedure used for data analysis follows the general structure of sociotechnical systems analysis but does not move into system design. The evidence was classified for use in the three phases of analysis: the open system scan, technical subsystem analysis and the social subsystem analysis. The classifications were in terms of the environment and the subsystems. Evidence items were extracted and recorded in data base categories established for each of the three phases of analysis.

In the open system scan the data was reviewed for evidence corresponding to the two levels of the environment. Evidence of the transactional environment denotes influences from outside the system boundaries (i.e. council itself) but within the organization (i.e. within the town government). Influence can flow across the system boundary with the transactional environment in either direction (Pava, 1983). The data was also reviewed for evidence of the contextual environment which is outside both the system and transactional environment boundaries. Influence from the contextual environment can only flow into the system by definition. The data was also reviewed during the open system scan for evidence to define the inputs and outputs of the system. The result of the open system scan was a description of the system and its environment.

For the technical analysis the data was first reviewed for evidence of the tools and techniques used in the process of transforming the information into a decision (Taylor & Felton, 1993). It was then reviewed for evidence of transformations in terms of deliberations of input information with respect to key issues. The data was also reviewed for evidence of the technical subsystem's capacity to control the interface between the system and its environment. The last aspect of data analysis for the technical subsystem was for evidence of breakdown in deliberations or gaps in information that led to confusion or unresolved issues. This is analogous to the search for factors that cause variance in a conventional sociotechnical systems analysis (Pava, 1983).

In the social subsystem analysis the data was reviewed for evidence of the various role each of the participants played during the deliberations and in the overall process. Also of interest was evidence of divergent views and possibly views that shifted to move the decision along. This is analogous to a shift to reduce variance (Pava, 1983).

Case Study Data Base Construction

Each participant and event in the cases being studied was assigned a data source code reference so that evidence pertaining to them could be recorded while preserving their anonymity. The code corresponded to their relationship to the system. (see Appendix 6) Categories were established to classify items of evidence extracted for the three phases of analysis. (see Figure 9) For the open system scan the categories included evidence of the contextual environment, transactional environment and the inputs and outputs of the system. For evidence to be used in the technical analysis, the categories were tools and techniques, key issues, deliberations, evidence of confusion in deliberations and interface control. For the social analysis phase categories were established for evidence of the participants roles and changes in their views.

Evidence items for each category were assigned an evidence item number and recorded. It was also given a code number that referred to its original data source. (see Appendix 6) The major themes and issues from each category in the case study data base were extracted and listed in outline form. The index number of the evidence item that supported each major theme or

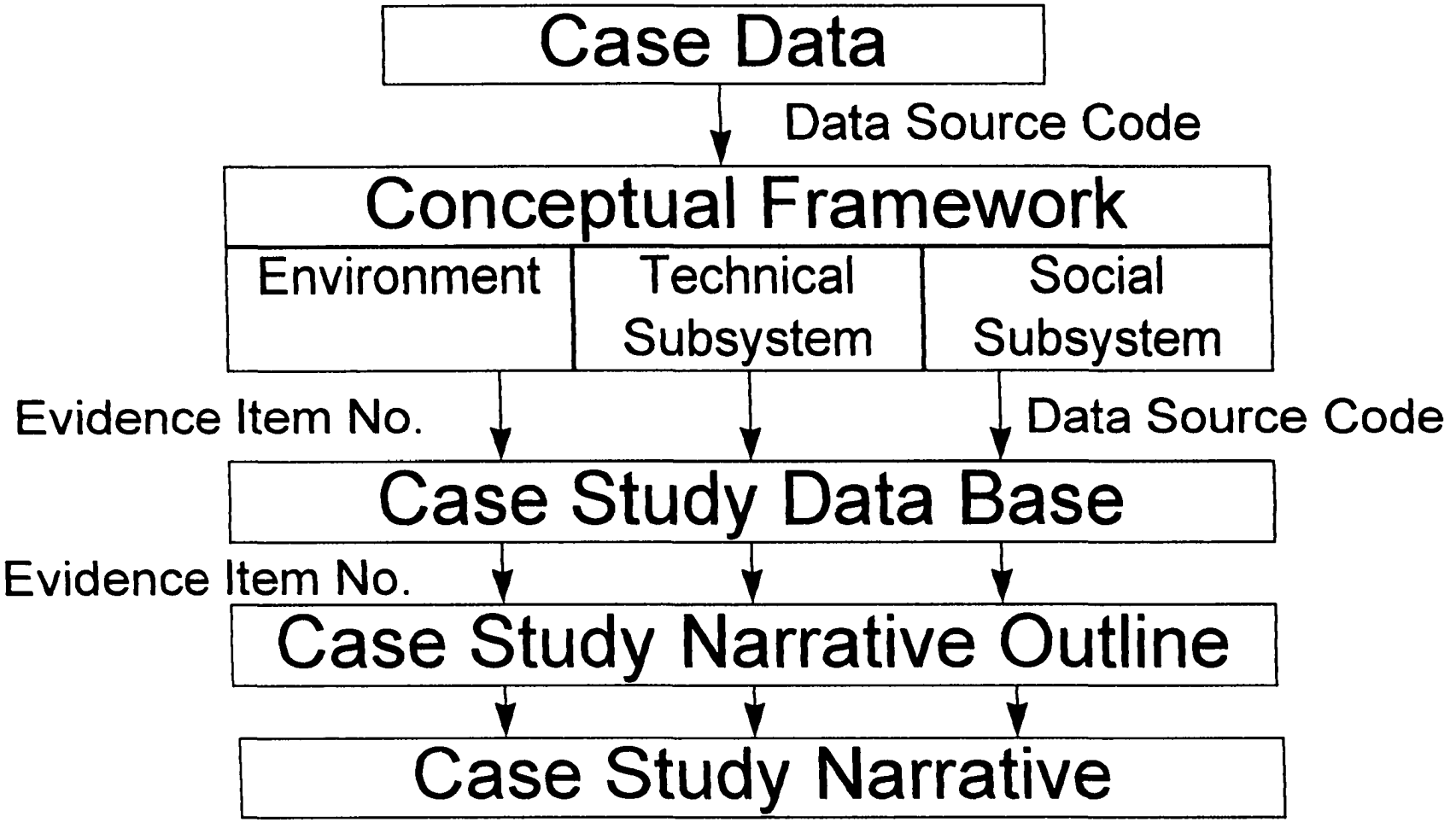

Figure 9. Case Data Base Construction

issue was listed next to it. For assessing the roles of the participants, a participant's data source code reference was listed next to major issues each time they were involved in deliberating those particular issues. The number of evidence items or participant data source codes citations associated with the theme or issue was used as an indication of the relative importance of the issue in the decision process or the emphasis that the participant was placing on a particular issue.

Case Narrative Construction

The case narratives were drafted using a format that roughly followed the sequence in the modified sociotechnical systems analysis structure. They began with an introduction which briefly described the purpose of the study. It also described the process used to analyze the data and draft the narrative portion of the case studies by briefly explaining each of the phases of sociotechnical systems analysis. The narrative then discussed the background and context surrounding the case. This included the overall project history including the feasibility study results. It also briefly discussed the decision processes that were going on in some of the other localities during the case time period.

The narratives described the contextual environment through three different aspects. They described the amount and type of citizen involvement and the political environment in each town. They also touched on the influence that neighboring localities were having on the towns' decision processes. The

case narratives went on to describe the transactional environment through the town managers' relationships to the town councils.

The information flow in and out of the system was described through the form of documents, presentations and discussions that the council members were provided. The intermediate outputs and inputs in the form of questions and clarifications were also noted. The narratives then discussed the final outputs of the systems and mentioned other possible outcomes. The system boundaries were described in terms of the councils formal structure. Any shifts in the boundaries that took place during the process, due to the roles of individual participants, were noted.

The tools and technologies used by the councils to deliberate issues and reach a decision were listed. These included the town government and the council structure itself, the rules for the conduct of council meetings and restrictions on how meetings could be held.

The narratives went on to describe the issues that were noted in the data as ones that would possibly be deliberated in order to reach a decision. The deliberations themselves were described in terms of the actual issues included The substance of the deliberation on each issue was described as well as the forum, either public or private, where the deliberation took place. Each issue was discussed as to whether or not it was resolved during deliberations and if the deliberations on the issue had any affect on the overall decision process or the outcome. Also noted was evidence when confusion affected the deliberations, any intermediate input that was provided that alleviated the

confusion and if the confusion stemmed from any individual or coalition. Another consideration was whether or not the confusion ultimately caused an issue not to be resolved and affected the outcome of the decision.

The case narratives described the roles of the individual participants in the decision process. They noted if there were champions of the decision topic as a whole or participants who were leaders in deliberations of individual issues. The actions of the participants were discussed in terms of the effects their actions had on the individual deliberations and /or on the decision process as a whole.

The case narratives were intended to be accurate depictions of the approval processes used in Watertown and Riverview for this particular proposal in these particular instances. Their accuracy depended on the researchers ability to correctly interpret the evidence in the case study data bases Multiple sources of evidence and the maintenance of a chain of evidence was used to enhance construct validity (Yin, 1983).

Case Verification

Draft copies of the case narratives were provided to selected council members and officials for their review and comment. They were selected based on the suggestions of the town manager of Watertown and the mayor of Riverview. Criteria for selection included varying points of view and a willingness to assist in the research. They were given the narratives for their respective towns which included the introduction and the main body but did not include the project history section. They were told that the sections they were

reviewing were part of a larger document and would be included as part of an academic dissertation. They were asked to review the narratives for accuracy and make any comments or additions they felt were necessary. Selecting council members who are considered stakeholders to review the draft narratives is another technique Yin (1994) recommends to enhance the case studies construct reliability. The review copies of the case narratives, with hand written comments, were returned to the researcher. The researcher then revised the case study narratives based on the comments received. Chapters V and VI of this document consist of the revised case narratives.

Cross Case Analysis

The goal of the cross case analysis was to explain the political decision process from a sociotechnical systems framework. This includes how the environment, technical subsystem and social subsystem interact to transform input information into a decision through the use of deliberations on issues. Given that the outcome of the decisions was known to be different before the data analysis was begun, the cross case analysis could highlight differences in the environments or how the council systems of each town accounted for their reaching opposite decisions based on the same general input information. This required explaining the actions of the environments, technical subsystems and the social subsystems of each town and noting differences that might have led to disparate outcomes.

Another goal of the cross case analysis was to determine where the system was most sensitive to influence from the environment. Knowing how the

council decision process works and how it processes input information, technical proposals and other topics could be structured to more effectively move through the decision process.

The cross case analysis was performed by reviewing comparable sections of the case narratives. The researcher then developed explanations for the similarities or differences with respect to the research framework and questions.

Interpretation of Results

The case study results were also analyzed as to the utility of sociotechnical system methods for analysis ofthese types of nonlinear systems. The analysis shed some light on the following questions: (1) Were the methods used a successful extension of the Pava (1983) non-linear sociotechnical systems framework for use in analysis of political decision making? (2) Can this still be considered a sociotechnical systems approach or has it migrated too far from the traditional sociotechnical systems methods? and (3) Is the use of case study methodology appropriate for use in a sociotechnical systems analysis? The domain to which the interpretation of the research results can be suggests that the generalizabiliy of case study research can be enhanced by replicating the results through further case studies (Yin, 1994). However, Patton (1986) takes another approach when considering external validity in qualitative research of which case study is one method. He suggests that generalizability in qualitative research is more appropriately understood in terms of reasonable extrapolation as mentioned in Chapter III (Patton, 1986). The concept of

reasonable extrapolation is consistent with case study methods. Case study methods are not capable of imposing the required controls necessary for the results to be generalizable under the traditional quantitative concept of external validity.

Summary

This chapter traced the development of the research design based on the methodological framework established in the previous chapter. The research design was based on using a modified sociotechnical system framework as an analysis method for a multiple case study. The phases in the case study data analysis correspond to the phases of sociotechnical systems analysis used by Pava (1983) for non-routine office work.

The data collection was discussed in detail with respect to data sources and data recording. The data analysis discussion traced the procedure of extracting evidence from the raw data, through its entry in the case study data base and then its inclusion in the case study narratives through the use of the modified sociotechnical systems framework. The development of the research design included discussions of reliability and validity and which aspects of the design addressed these issues.

The research design presents the approach used to conduct the research. It was explained in such a way as to be usable by other researchers conducting similar studies on other elected bodies so that their results combined with those from this study could expand the domain of generalizability.

CHAPTER V

WATERTOWN, A CASE STUDY

Introduction

The purpose of this study was to investigate the decision process used by an elected governmental body in dealing with a complex public works proposal. In this study the elected governmental body is a town council. It focuses on how the technical decisions are made in the political environment by looking at the steps in the process, the key players and the factors that affected the outcome.

This study should lead to a clearer understanding of what can be done early in the proposal evaluation process to improve the transformation of information into a decision, or, in the case of engineering studies, how they can be improved to be more effectively used in a political decision process.

The data was analyzed using a sociotechnical systems framework. This framework focuses the analysis on three distinct phases: an environment scan, an analysis of the technical aspects of the process, and an analysis of the social aspects of the process. A sociotechnical system transforms inputs (materials) into outputs (products) through a process. In the case of a town council the input is information, the process is deliberation and the output is decisions or policies (Pava, 1983).

The environmental scan attempts to describe the environment or the conditions within which the council operates. It is concerned with two levels of influence. The transactional environment includes the town staff and any other entities that not only influence the council but are also influenced by it (two way influence). The contextual environment includes generally those who influence council but are not directly influenced by it (one way influence)

The environment also includes the input and output for the decision process which, in this case is the information provided to the council and the final decision that it makes on the proposal. There may also be intermediate inputs and outputs consisting of questions and responses to clarify issues

The technical analysis focuses on the tools and techniques used by council to reach a decision, along with the issues themselves, and the deliberations that take place. In the case of a town council the structure of the council itself and the rules under which it conducts business are the tools and techniques it uses to come to a decision. Information flow and the deliberations are largely controlled by the rules of order, the state's freedom of information statutes and other rules covering the conduct of official business. The actions of the town manager in summarizing information and setting the agenda are also considered tools used by the council in deliberations.

Issues are the central focus of deliberations. Issues exist in any decision process. There are standing issues such as taxes or quality of town life upon which all topics are evaluated. Other issues are specific to the topic. Input information is evaluated against issues to determine how the town will be affected by the decision. Each council must deliberate a specific set of issues to transform information into decisions or policies. Issues are often the result of influence from the environment.

Deliberation is the process of evaluating input information against issues to transform it into decisions. Intermediate outputs in the form of questions may require supplemental information to complete the deliberation. Deliberations on various issues may take place concurrently or in sequence (Pava, 1983). The output from the individual deliberations form the input for the final decision

Deliberations can take place in a variety of forums and may include interactions with the environment.

The social analysis is used to determine the roles of the various participants in the process. It studies the deliberations to determine how the participants interact to help move them towards resolution. It identifies participants who take the lead in deliberating different issues. A determination is made concerning which issues are important to each participant.

Background

A large metropolitan public utility was asked by the localities in a rural region of the southeastern United Stated to determine the feasibility of the utility providing wastewater collection and treatment service to the population centers in the region. The utility responded by assigning a senior engineering manager to establish an office in the rural region to perform the study.

The study was completed and approved by the metropolitan public utility's governance board in February 1996. There were three primary recommendations of the study. First, it recommended forming a separate division within the utility to operate the existing treatment system in the rural region. Second, it recommended that the division be a financially separate cost center to maintain the localities' eligibility for grants and low interest loans that are only available to small communities. Finally, in order to maintain a level of local control, the study proposes the formation of a regional advisory board, comprised of representatives from each of the rural localities, to adopt the rural division's rates and budgets and to set priorities for capital improvements and expansions. Operating costs were estimated to remain low through the use of automation and electronic process monitoring which would keep the need for operating personnel to a minimum.

There were four counties and two towns in the rural region who seriously considered the proposal. (see Table 1, p.4) Only four of them had existing wastewater systems. These systems were relatively small and all of them had to elect to become a part of the rural division to comprise a large enough customer base for the division to be financially viable. The localities without systems could also join the division, but they would not have a vote on the regional advisory board until service was expanded into their areas.

The study concluded that, given enough participants, the rural division would be feasible from both an engineering and a financial standpoint. The final decision for each locality to join the metropolitan public utility and form the rural division rested with the elected officials. The same decision was considered independently by six different political bodies. There were many issues that these bodies had to consider. The issue of public opinion concerning growth and local control was different in each of the localities. There was also the matter of its being an election year for some of the elected officials. The issue of regional cooperation verses independence has been a continuing issue for the elected bodies and other regional organizations.

The research was built around a case study of two localities making the decision whether or not to join the metropolitan public utility in formation of the rural division. Each locality had been given the same information.

The Watertown Environment

Watertown is an incorporated community of approximately six hundred people. It is situated in a relatively rural area of the southeastern United States It is a town which means that it is part of a larger county. The town and the county share some services. Residents of the town are citizens of both the town and the county. They are represented at the county level by a member on the

county board of supervisors. They also pay taxes to both the county and the town.

Its organization is the mayor-council form of government. It consists of a town council with members elected at large for two year terms. The mayor is directly elected also for a two year term and votes only in the event of a tie and serves as the chief executive officer. The council employs a town manager to serve as chief operating officer and manage the day to day activities of the town.

Regular meetings of the council are held on a monthly basis usually on the third Monday of every month. The agenda for the meeting is drafted by the town manager and distributed to the council members in advance along with other background information. The meetings are run using a standard form of parliamentary procedure. Typically motions require a second which then opens discussion on the issues surrounding the motion. A motion and a vote are required to then close discussion and put the original motion to a vote (call the question). The town has the authority to adopt supplemental rules of order This town, among others, has adopted a rule that the mayor may only vote on a motion if his vote will result in a tie break. The practical implication of this rule is that the mayor rarely votes on any motion.

As with other elected bodies in the state, the Watertown town council conducts its business within the framework of state's freedom of information statute. This ensures public scrutiny of actions by council. It prescribes that meetings of council, with some exceptions, must be open to the public A meeting of more than two council members is considered an official act of the council and must, therefore, be advertised in advance and open to the public The council can, however, discuss personnel, legal , and other specifically authorized topics in a closed session, often called executive session, provided

that the topic is announced to the public in advance. No votes can be taken during the executive session. The mayor and the council must subsequently certify in public session that only those topics authorized by law and disclosed before the executive session were discussed. Any council decisions or actions that are to be taken on items discussed in an executive session must be made in a forum open to the public.

Discussions with council members revealed some of the political and social background of this particular council. The decision of an individual to run for town council is often more social than political. A person who runs will tend to represent a social constituency rather than a political party. In my discussions with council members political party labels only came up in reference to one individual whose view were seen as keeping strictly with the ideology of a particular political party. One council person mentioned that his decision to run for may be based on the probably of losing the election rather than winning. A defeat would cause a loss of prestige in the community and alter ones social status.

Throughout the deliberations there was little or no citizen involvement. When asked if this was typical, council members replied that, in general, the citizens will respond to issues that they perceive will impact them directly. Education and taxes are examples of issues that will elicit citizen involvement and citizens will tend to react emotionally to issues such as these.

The town has a local weekly newspaper which ran a series of articles on the project that described the project in detail and discussed many of the issues. The paper also covered the activities in other neighboring localities as they went through similar deliberations.

There is some influence from neighboring localities. The town manager interfaces with his counterparts in other localities on a regular basis. There are owners of businesses in town who reside outside of town but are influential in town affairs since the taxes on their businesses are a significant part of the town's revenue base. Some citizens are concerned about the effect the town's decision will have on the neighboring locality.

At the same time the public works proposal was considered, there were other regional initiatives also being considered. All of the localities in the area are part of a regional corrections authority. There was much controversy surrounding the siting of a new corrections facility. One of the proposed sites was in the neighboring locality not far from the town limits. Opponents of the corrections facility project were contending that the treated wastewater from the facility's wastewater treatment plant would increase pollution of the adjoining waterway. This is the same waterway that the town's wastewater treatment plant discharges into. There was also an effort underway to encourage the area localities to participate in the development of a regional airport.

As noted above, the town manager runs the day to day operation of the towns activities. He is an employee of the town and takes direction directly from council. He also develops issues to be put on the agenda for council meetings In that role he is in position to control the flow of information to council. He also interprets issues for the council which often does not have the detailed knowledge or background to deal with technical issues directly. This is done by summarizing the relevant concepts for issues under deliberation. He also apprises them of background information that would affect their decision For complex issues he develops detailed briefing papers that translate those issues into language the council members can understand.

Another role of the town manager is to interpret and then implement policies enacted by town council. In this position he is often the focal point for citizen complaints about council policy.

Influence flows in both directions between the town manager and council Council enacts policy that influences his position as the town's operating officer He, in turn, will try to influence council to enact policies that, from his perspective, are in the best interest of the town or make his job easier. These are often conflicting requirements.

The town manager was a strong proponent of the public works proposal and provided information for the initial feasibility study. He was also a vocal supporter of the proposal in meetings with officials from other localities. Through the briefing papers he produced for council and his dialogue at council meetings, he aggressively supported the project.

Inputs and Outputs of the Deliberations

Initial Input

The deliberations in this study would ultimately result in a decision whether or not Watertown should join a metropolitan public utility that would provide wastewater collection and treatment. Decisions of this type are very complex and usually involve technical issues. The town manager felt that it was his task to interpret the issues for council and fully brief them before any public deliberations took place. It was explicit that he was in favor of the proposal and would try to influence council to decide to join the metropolitan public utility

As with most major public works decisions, the chief source of information was an engineering feasibility study report. The study, which looked at operational and financial aspects of setting up a rural division of the metropolitan public utility to provide wastewater service, on a regional basis, for the town and

the neighboring localities, determined that it was feasible to set up such an division provided that enough localities would join to make the division financially viable.

The report was made available in either its full edition or in an executive summary. The town manager decided how many of each version to request and to whom to distribute them. Full editions of the report were on display in the town office for both council members and citizens who wanted to refer to them.

The town manager developed detailed briefing papers from the information contained in the report. The briefing papers were distributed to all council members and made available to the public and the local newspaper. They contained a detailed comparison of the current town wastewater operation and that of the proposed regional agency. An important point was that, given the expected level of participation by other localities, the overall cost of wastewater collection and treatment for the town was estimated to decrease.

Some council members commented about the briefing papers during interviews following the decision. They felt that the amount and character of information that they received from the town manager in briefing papers and other documents was unique to their town. One council member noted from discussion with officials from other localities at regional functions that the Watertown council was better informed. They rely on the briefing papers to be able to absorb complex issues without being overwhelmed. Some council members prefer the town manager to include information about the key players on topics in the briefing papers.

To better inform council, the town manager set up a series of private meetings between council members and the project manager The meetings could only be held with two council members at a time to comply with the

provisions of the state's freedom of information statute. The town manager did not attend these meetings. The purpose of the meetings was to brief the council members and to allow them to ask questions that they might be reluctant to ask in public. Discussions took place between the council members and the project manager and between the council members themselves. In later interviews both the council members and the town manager felt that these meetings were very helpful in clarifying some of the more complex issues. One council member said that these meetings were also an opportunity to evaluate the information given them by the town manager and to determine to what extent his information was biased.

Individual council members had other sources of information. They were all invited to, and some attended, a dinner meeting of the regional planning authority which included a presentation on the proposal followed by a question and answer period. The council members who attended were able to listen to questions that were asked by officials from other localities to hear what issues they considered important for their deliberations. Council members attending also had the chance to ask questions of upper management officials from the metropolitan public utility to get a feel for the type of agency they might be dealing with in the future. One council person commented in a later interview that she was impressed with the quality of the metropolitan public utility's upper management.

There are council members who are also members of regional planning boards and other agencies. These members could interface with council and board members from other localities that were deliberating the same issues and exchange views

Council members note that for decisions such as these they must rely on expert opinion, either from the town manager or from outsiders, to help them clarify the technical issues. They realize, however, that these experts are often biased providers of information.

Intermediate Outputs and Inputs

Deliberations of the issues also generated new questions and requests for clarification. These questions were considered intermediate outputs of the deliberations. The deliberation tended to focus on a few critical issues and the questions generated were, therefore, specific and required specific answers Since many of the issues being deliberated were technical, the questions commonly asked required that the town manager explain the issues or give examples of how the issues impact the town or its citizens. At times the town manager would have to defer to an outside expert, such as the project manager, to explain specific details.

Intermediate questions sometimes had another purpose. Individual council members could use them to raise an issue that they thought was not getting enough attention. A question of this type can lead to follow up questions by other council members and change the direction of the deliberation. As an example, a council member asked a question in open session about the possibility of the town having a veto over the actions of the metropolitan public utility. This opened a totally new line of discussion, having to do with the town losing control of its destiny. The discussion involved not only the council members but also the town manager, the regional agency's project manager and several citizens. This technique is especially effective if a council member wants to "stir up the pot" by using a particularly emotional issue

Final Output

There were three possible forms of output from these council deliberations. They could vote in favor of the motion that was under discussion. In this case the motion was to direct the mayor to send a letter committing the town to join the metropolitan public utility if the utility determined that there were sufficient localities willing to join making the proposal technically and financially viable. They could have voted against the motion which would in effect. send a clear signal to the metropolitan public utility that the town was not interested in pursuing the matter further. Or, they could vote to table the motion for further discussion and possible reconsideration at future time.

Any of the above outputs would require a majority vote of council. As noted, the mayor only votes if a tie break is required . Since the vote was five to one in favor of the motion to send the letter of commitment, the mayor's vote was not required.

Environment Boundaries

There is no explicit evidence in this case study data that identifies the boundary between the council and its environment. However. some initial boundaries can be assumed based or the town's organizational structure The town council is the central core of town government. The town manager is an employee of the town and takes direction from council and also is in a position to influence the council. That places him in, what is referred to in sociotechnical systems terms, as the "transactional" environment (Pava, 1983). The transactional environment is defined as being outside the system but both influencing and influenced by the system. Groups such as the town's citizens. outside experts and the media would be considered in the "contextual" environment (Pava, 1983) because they influence the council but are not directly

influenced by it. Of course, in reality everything the council does affects the entire environment to some extent. Therefore, it can be argued that there is no contextual environment, only a transactional environment. However, for the purposes of study we assume that both exist to make it easier to categorize the actions of individuals.

Tools and Techniques

The tools and techniques used by the town council to transform input information into an output decision reside largely in the structure of council itself and the rules under which it conducts business. Much of the structure is prescribed by state code and whatever internal rules that the council has set up to conduct business.

Meeting Agenda

The town manager begins the process by polling the council and then sets the agenda for the council meeting. He gets input from the mayor and other council members on issues that they would like to discuss and act on at the council meetings. He also has his own items to address regarding town business and policies. The town manager has a great deal of influence as to the order in which topics are deliberated. In this case the choice of which meetings would be used to discuss the regional wastewater topics and the timing of the public comment periods had much to do with the course of deliberations

Conduct of Meetings

The town manager opens the discussion on each agenda topic with a brief statement of his position and what action, if any, he recommends the council take. Except in rare cases, the town manager has a specific recommendation that he would like council to follow. His comments, therefore, cannot be considered to be neutral. His comments probably have a greater

effect on those council members who are not well briefed because either they have not taken the time to read the briefing materials provided or they have no interest in the topic. In this case the council members were well briefed on the topic and knew what the town manager's position was. His opening comments had very little effect on the deliberations that followed.

The mayor, chair of the council, has some control of the flow of the discussion. This control is limited, however, by the rules and procedures. Any council member can use the rules of procedure to affect the flow of discussion and the conduct of business.

Citizen Participation

The town council can get public input through the use of public hearings and public comment periods during council meetings. The town council is legally bound to hold public hearings on certain types of issues. Issues concerning taxes or land use are probably the most common. The rules for the conduct of public hearings are specific and are spelled out in detail in the state code for each topic. The mayor formally opens and closes public hearings and can then entertain motions to take action on the issues.

A public comment period is an informal forum to receive public input. It can be opened and closed by the mayor at any time, and there are no legal requirements that all present citizens be heard. There is also no requirement that the council take action after the public comment session is closed.

In this instance, the town council chose to take citizen input in the form of public comment periods although there was no legal requirement to do so. The town manager, with input from the mayor chose, to have two public comment periods during successive council meetings. At the first meeting the proposal was on the agenda following a contentious issue involving certain business

license fees. All of the citizens who attended to speak concerning the license fee issue left the meeting before the proposal came up. That public comment session was used for internal deliberation on the issues and clarification of some of the issues by the town manager and the metropolitan public utility's project manager. Had the order of the agenda been reversed, there may have been stray comments on the proposal from citizens who were waiting to speak on the license fee issue. After the public comment period on the proposal was closed, the council would have moved on to the next agenda item without deliberating the proposal at the meeting.

For the second council meeting the agenda listed a public comment period on the topic followed by a recommendation by the town manager to act on a letter committing the town to joining the metropolitan public utility. There were no contentious issues scheduled prior to the topic, so very few citizens attended and only two remained to comment on the topic once the mayor opened the public comment session. Without formal structure, the public comment period became virtually a debate between the two citizens who were opposed to the proposal, a council member who was also opposed and the town manager.

Restrictions on Meetings

Regulations such as the state's freedom of information statute restrict the way that council members can meet to deliberate issues. They are designed to ensure that the public has complete access to the governmental process. The statute requires that no more than two council members can meet without the meeting's being open to the public, and the actions of the meeting are to be recorded in the minutes. This also applies to council work sessions in which the members meet to discuss topics informally.

Council has the authority to adjourn a meeting to go into private or executive session to discuss certain issues but this is even subject to restrictions. Executive sessions are usually reserved for issues surrounding active or pending legal action, real estate procurement issues or personnel matters in which the public 'right to know' might conflict with an individual's right to privacy as defined by the state's privacy statute. The mayor must disclose publicly the items that are to be discussed in the executive session. Following the executive session, the mayor and council must certify that only those items previously disclosed were discussed. Official action on items discussed in executive session must be taken during public session.

Issues

Providing public services is one of the most important and probably the largest of the governmental functions. It is the most complex topic the town councils deal with. In cases where the public services involve utilities, many of the issues are technical and difficult for some council members to understand Because they impact the citizens directly, the issues that are deliberated tend to become emotionally charged. Several major issues came to light during Watertown's deliberations on the proposal of whether or not to turn over the operation and maintenance of the town's wastewater facilities to the metropolitan public utility's rural division. Many of these issues are technical and some of them are emotionally charged.

Autonomy and Control

The sovereignty issue came up in many forms throughout the deliberations. There were several sub issues deliberated that all dealt with the concern of some council members and citizens who perceive that joining a metropolitan public utility would cause the town to lose some of its sovereignty

This was the theme of the issues brought up by one particular council member. The council member brought up the issue that the town needed veto power over the actions of the metropolitan public utility to protect its vital interests. It was discussed at length both privately and publicly. The basis of their argument was that the town, being a relatively small community, would have little or no say in actions taken by the utility that would adversely affect the town. The utility, for example could build or expand wastewater treatment facilities either within or just outside the town limits, thereby, hurting property values in town despite the town's objections. Another perceived disadvantage of the town is not having a veto would be that the utility could increase the capacity of the existing treatment system and further pollute the adjoining waterway without seeking town approval. In effect, the council member was arguing that by joining a metropolitan public utility, the town would be giving up the ability to fully control its public health, safety and welfare interests.

A counter to these arguments is that all of the localities would have to be granted the veto power. Another locality participating in the utility's rural division could, in turn, veto projects that would otherwise benefit the town. In fact, given the technical constraints of providing wastewater service on a regional basis. this would be a more likely scenario in a veto empowered setting.

The mayor commented in an interview that the autonomy or control issue comes up frequently in one form or another. He thinks that it's an emotional reaction that emerges whenever the town talks about giving up some of its power or authority. Similar arguments were used against a regional solid waste agency proposal and the siting of the regional corrections facility.

Loss of a Financial Asset

Part of the proposal to join the metropolitan public utility included transfer of ownership of the wastewater facility, along with its inherent liabilities, to the utility. A common argument against this was that the wastewater facilities are assumed to be financial assets, and their loss would reduce the value of the town's portfolio, and hence its borrowing power. Some argued that if the town transferred ownership then it should be paid for the facilities.

The other side of this issue is that it is the service provided by the facilities, not the wastewater facilities themselves, that is an asset to the town. It makes no difference who owns the wastewater facilities. The town's borrowing power is based on its revenue generating potential which comes from its full faith and credit and ability to tax property and pledge revenues.

The town's wastewater service customers have been paying for the facilities through their water and sewer rates. If the metropolitan public utility were to reimburse the town for those facilities, they would in turn have to charge the same customers for the cost of the reimbursement. In effect the customers would be paying for the facilities twice.

The Impact of Out-of-Town Customers

Several years ago a number of housing developments were built just outside the town limits. At their request the town extended water service but not wastewater service into those areas. Since that time these out-of-town customers have been paying a higher rate for water than the in-town customers The higher rates were justified by noting that those in town paid the majority of the capital costs to construct the water system, and fully bear the risk associated with ownership. It was only fair that the out-of-town customers pay to reimburse the town for the capital cost of the portion of the facilities that serves them.

The town manager argued that in time there would be political pressure on the town to also provide wastewater service in those areas. He contended that the pressure would come from business owners in town, who are influential, but reside outside of town. Based on his own experience, he felt that the town's existing wastewater treatment plant would not have the capacity to handle both the needs of the town and those of out-of-town customers. The issue, as he saw it, was that the town could either try to bear the political pressure of denying wastewater service to the out-of-town customers, some of whom already have failing on-site wastewater disposal systems, or it could join a regional agency that could build a larger capacity wastewater system in another locality that could handle both the in-town and the out-of-town customers.

The other side of the argument is that the metropolitan public utility would find it easier to attempt an expansion of the town's existing wastewater treatment facilities which would increase the pollution in the adjoining waterway and lower property values in town. By using its power of eminent domain, the utility could do this without town approval.

Environmental Issues

Environmental issues were mentioned as a concern by several of the council members during private discussions, but they did not figure prominently in the public deliberations. Pollution of the adjoining waterway was an issue that was argued both ways. Some council members were concerned that having the metropolitan public utility handle the wastewater and increase treatment capacity could lead to more development and result in an increase in the pollution of the adjoining waterway. Others saw the utility as being able to serve areas that now have existing, and possibly failing, on-site disposal systems. In effect, this would reduce the pollution in the adjoining waterway.

Encroaching Development and Urbanization

One citizen was concerned that if the town joined the metropolitan public utility, it would make centralized wastewater service available in all of the surrounding area. That would encourage uncontrolled development in all of the neighboring localities and ruin the rural nature of the region. He argued that the town's decision to join the utility would be the first step in destroying an attractive way of life. Some citizens feel that the town's autonomy is their only defense against creeping urbanization which threatens the small town, rural atmosphere that they value.

Cost of Service

The feasibility study determined the cost to the customers of the town if they joined metropolitan public utility. The town manager produced a detailed comparison of the existing town wastewater service rates and the proposed rural divisions rates. It showed that there would be savings to the town's customers if the town participated in the utility's rural division. So, for most of the council members, rates were not an issue. Moreover, since rates or taxes tend to be issues that elicit response from the citizens, their lack of participation in the deliberations signals the fact that, in this case, rates did not become an important issue generally. However, one council member was of the opinion that the utility should guarantee in writing, that the rates would not increase in the future. He was joined on this issue by a prominent citizen.

Facilities Management

Only one council member commented about the issue that the town may be better off with the metropolitan public utility's operating the wastewater facilities because they specialize in that field. The member felt that a

specialized utility would be better able to meet the demands of future regulatory requirements. This sentiment was shared by the town manager.

Regionalism

Regionalism as an issue can be described as cooperation among localities on projects that provide mutual benefit. It has been used in this case to describe participation among localities to provide needed services at lower overall cost through centralization and more efficient use of resources. The town manager would like to see the town participate in the metropolitan public utility's rural division in order to take advantage of larger economies of scale in providing wastewater services. In order for the rural division to be formed, there must be a minimum number of participating localities. This would ensure a sufficient customer base so that the agency would be financially viable.

There have been previous regional initiatives. The localities each have different opinions on whether their experiences have been good or bad. There was an established regional solid waste agency that had been in operation for some time. In general, opinions are that it served the region well. The regional correction authority also has a long history. However, attempts to find a suitable location for a new correctional facility caused friction among the localities. Everyone knew that the new facility is necessary and that they would benefit, but no one wanted a jail built in his locality.

The regionalism issue also conflicts with the autonomy and control issue. Being a part of a regional agency means that a locality must give up some control of the services the agency provides to gain the benefits.

Deliberations

Forums

The deliberations on issues took place in different forums. Some of these forums were private discussions between individuals while others were in public meetings. Issues that were deliberated extensively in private discussions, with a few exceptions, tended not to be deliberated in the public forums.

Autonomy and Control

The autonomy and control issue was put forward by one council member and deliberated in both public and private forums. It was deliberated among the council members and discussed among council members and the town manager in private sessions. It was also deliberated extensively in public among the same groups. There is evidence that council members discussed this issue with citizens in private. Citizens openly joined in the discussion in the public sessions.

Despite the extensive deliberations, only one council member was convinced that the autonomy and control issue was serious enough to oppose the decision to join the metropolitan public utility. One of the council members noted in an interview following the decision that the council member and the citizens who pushed the autonomy and control issue were of the same political ideology.

Encroaching Development and Urbanization.

This issue was not deliberated as extensively in private as the autonomy and control issue. There is evidence that two council members did discuss it in private. It was, however, deliberated extensively in public among the same groups as the autonomy and control issue. The deliberations were between those whose first concern was protecting the town's future and those who saw

the town's action as a threat to the whole region. The fate of this issue was also similar to the autonomy and control issue in that only one council member saw this issue as a reason to oppose the decision to join the metropolitan public utility.

Regionalism

The regionalism issue was not deliberated by itself. It came up in deliberations on other issues such as the autonomy and control and encroaching development and urbanization.

Out-of-Town Water Customers

The issue of the out-of-town water customers encompassed many sub issues. However, during deliberations the discussion revolved around the effect that providing them with wastewater service would have on the existing town system. The issue was deliberated in public session among the council members and between the council members and the town manager. The town manager contended that if the town provided the out-of-town customers with wastewater service, it would use up all of the available reserve capacity of the existing facilities, thereby, leaving the town with no capacity for future development. This would force the town into expanding the facilities and incurring a significant amount of debt which would make the rates extremely high. Some of the council members were of the opinion that the town has an ethical obligation to extend wastewater service to the out-of-town customers who have been provided water service.

Facility Operations

The issue of an improved facility operation under a metropolitan public utility was not deliberated in public. There were private discussions among the council members and between council members and the town manager

concerning this issue. In general, most council members accepted the town manager's opinion that the proposed rural division would have a greater level of expertise in the operation and maintenance of wastewater facilities. Therefore, the deliberation moved to whether or not the town could satisfactorily operate and maintain the facilities. Some council members maintained that since the town was currently operating the facilities, it could continue to do so. The town manager's opinion was that it could, but not indefinitely. He noted that the town had just spent a great deal of money to rehabilitate the facilities after some years of neglect. The town manager is afraid that given the changing political conditions and financial priorities, the council could allow the facilities to fall into disrepair again to the point that they would no longer be reliable.

Environmental Issues

Environmental issues did not play a large part in the deliberations and were not deliberated in public. Environmental issues were mainly used in discussions to reinforce points on other issues. Control over the pollution level in the adjoining waterway was given as one of the points in the autonomy and control issue. The argument was that the town would lose control over what goes into the waterway and the environment would deteriorate. All of the council members agreed that they did not want to see the waterway receive any more pollution. Therefore, the issue became whether the best way to protect the waterway was to keep the wastewater facilities in town hands or join the metropolitan public utility. One council member framed the issue in a larger perspective by saying that if the entire area did not accept some kind of centralized wastewater management, then eventually all of the waterways would be polluted.

Loss of a Financial Asset

This issue was deliberated in private in the early stages. It never came up in the public deliberations after some council members came to realize the facilities were more liabilities than assets. Most council members did not see it as a major issue.

Decision Process

Although not strictly an issue, there was some discussion in the public sessions on the decision process itself. Upon seeing that the deliberations were probably going to result in a decision in favor of joining the metropolitan public utility, one council member made a motion that the decision be put to a vote of the entire town by referendum. This motion failed for lack of a second.

Decision

Following the second public comment period, a motion was made that the mayor send a letter to commit the town to participating in the metropolitan public utility's rural division if such a division was determined to be viable. The motion was seconded and was followed by a vote. The vote was five to one in favor

Confusion in Deliberations

There was evidence of confusion in many of the issues that were deliberated. Efforts to resolve the confusion usually involved questions directed to either the town manager or to the metropolitan public utility's project manager. The mayor or council members often asked for detailed explanations to clarify some of the more complex issues. Since many of these issues were explained during private discussions, not all of the council members had had the benefits of these clarifications.

An example of an issue that caused confusion was rates and costs. One of the problems was that the current rates paid by the customer and the rate

estimates developed in the feasibility study report were not directly comparable They were based on different minimum charges. They were also confusing in that the town's existing rate structure was developed around a combined water and wastewater operation, whereas the metropolitan public utility dealt strictly with wastewater. The town manager attempted to clarify this issue in his briefing papers and was partially successful in eliminating some of the confusion. However, we later agreed that it was best to compare the overall cost of the town's wastewater operation as listed in the town budget with the town's portion of the overall utility's operational cost estimates. This reduced the issue to one of comparing two numbers.

There was also some confusion with the connection fee concept. The metropolitan public utility was proposing a two part connection fee. One part would strictly cover the actual cost of making the connection. Customers who were already connected to the town's wastewater system would not have to pay this charge. The other part of the fee was a charge to cover part of the capital cost of providing the wastewater facilities. Not only would the existing town wastewater customer be exempt from this fee but also new customers who would connect to the system and abandon onsite disposal systems. This concept had to be explained many times during the deliberations.

The mayor noted, in an interview following the decision, that these were all complex issues for council members. Some of them do not have the technical or financial background to understand these types of issues. Therefore, they would each tend to focus on the issues that they could readily understand. Many times these would be the issues that were more political or emotional than technical. The deliberations would get bogged down on the emotional issues and neglect the more relevant technical and financial issues.

There was some confusion in discussion between council members and the town manager. An example of this was a discussion between the town manager and a council member regarding the capacity of the town's existing wastewater system. The town manager was discussing the capacity issue in terms of the effect the out-of-town customers would have if brought onto the existing system without expansion. At the same time the council member was approaching the issue from the standpoint of where an expansion to the existing wastewater treatment plant would be built in order to accommodate out-of-town customers. There was no progress during the discussion because they were actually discussing different issues.

On the other hand, one council member said that there was not much confusion during the deliberations. He had indicated in private discussions early on that he was solidly in favor of joining the metropolitan public utility. The evidence shows that he did not participate to any great extent in the public deliberations. Since his mind was made up early, any confusion during the deliberations was irrelevant.

Roles in Deliberation

The evidence shows that no real proposal champion emerged from among the council members. Most of them looked to the town manager to lead them through the deliberations. He is also in a unique position to influence the outcome of deliberations. In his role as the interpreter of complex issues he can emphasize certain points which will affect how council members perceive an issue. In public deliberations he usually gives an opening briefing on issues that can set the tone of subsequent discussions. Many times during the course of deliberations he is asked to provide clarification on issues. The result is that much of the dialogue during deliberations is in the form of questions and

responses between the town manager and council members. In public sessions citizens will often engage in discussions with him rather than directly with council members.

In this case the town manager was a vocal proponent of the proposal to participate in the metropolitan public utility's rural division. He was involved extensively during the study phase and contributed information that was used in drafting the report. He produced detailed briefing papers and distributed them to council members to explain the issues that he thought were relevant.

One council member played a dominant role in the deliberation of the issues and sub issues surrounding autonomy and control. His first issue was the loss of a financial asset, and although other council members were aware of the issue, it was never deliberated in public. The issue was deliberated in private discussion between him and the town manager. According to other council members, he prefers to deliberate issues in private discussions. He may disagree on issues, but it does not seem to affect his personal relationships with the other council members.

His second was the veto issue. He argued that the town needed a veto against action of the metropolitan public utility. He kept this issue prominent throughout the deliberations involving not only the council members and town manager in the discussion but also citizens and the regional agency project manager as well. He also supported citizens in a discussion over the issue that the town should be guaranteed that the utility would not raise the rates or expand the existing wastewater treatment plant.

The mayor was in favor of the proposal from the beginning. He was involved in discussions with both the town manager and the metropolitan public utility's project manager during the study phase of the project.

In his role as chair of the public sessions, the mayor would stop discussion and ask for clarification on issues if he thought deliberations were bogging down. At one point he commented that he was disappointed that some of the people speaking on the issues were not better prepared.

Most council members apparently made their own decisions based on the feasibility study report, the town managers briefing papers and private discussions. They did not participate much in the public deliberations. In fact, they did not seem to be affected by the public deliberations.

Although she could not speak for others, one council member described how she had prepared for deliberations on issues such as these. She read the briefing papers that the town manager developed very carefully and then asked him to clarify issues. She discussed issues with other council members privately. Thus, she was usually fully briefed on the issues before they went to public deliberation. She said that she let everyone know her position up front As a member of the regional planning agency's board of directors, she also had access to discussion from that source and from attending the dinner meeting of the regional planning agency.

The dissenting council member was very vocal on these issues during public deliberations. Another council member commented that often times he will actively discuss issues because he "loves the game" rather than merits of the issue. This sometimes disturbs other council members who take those particular issues seriously.

Paradoxically, there were comments that this same council member was often very reluctant to speak during public deliberations often enlisting other council members to make comments for him.

As noted earlier, some of the citizens who participated in the deliberations are of a similar political ideology, that is distrustful of "big government". He cast the sole dissenting vote on the decision. After the vote he was visibly upset and seemed to take it as a personal defeat.

Another council member saw herself as representing the senior citizens in town. The issues that she vocalized were mainly those concerning the rates which could impact citizens on a fixed income. She was in favor of the proposal from the beginning and made some comments on the issue of putting the decision to a referendum. She noted that there was not much citizen participation at any of the public forums where these issues were discussed, and she doubted that there would be much voter participation on a referendum

A council member who has a small business in town was said to abstain on most controversial decisions because he does not want to anger potential customers. He was supportive of the proposal in private discussions. He was not vocal during the public deliberations but voted in favor.

Conclusion

This case study narrative was developed from data collected from actual events that transpired during the decision process over the proposal to join the metropolitan public utility. It was analyzed using a modified sociotechnical systems conceptual framework developed by Pava (1983) for use with non-routine office work and refined for use in this case study. The case study narrative was drafted in a structure that utilized the categories that were developed from the conceptual framework for data analysis.

Traditionally sociotechnical systems conceptual frameworks have been used in organizational interventions in efforts combining analysis with work design. One of the research questions for this study inquired about whether or

not a modified sociotechnical systems conceptual framework could be used as strictly an analysis tool for data analysis in case study research. To be appropriate for case study research, data analyzed using this conceptual framework would have to be useable for development of an accurate case narrative.

This case narrative was drafted and copies were distributed to selected case participants for review. They were asked to make any corrections or comments they deemed appropriate and record them directly on the draft copies. Copies of the rough drafts given to the participants are exhibited in Appendix 1 Upon their return there were no substantial inaccuracies noted in the participant's comments. There were some minor clarification items noted, mostly having to do with town policy and structure, and these were corrected in the edition above. There were also grammatical and typographical errors which were also corrected. Some representative comments that were noted in the returned drafts are listed in Appendix 3. The fact that there were very few inaccuracies reported is evidence that the narrative reflects what the participants felt were the actual events. Their reflection served to verify that the data used to produce the narrative was accurate and is evidence that the conceptual framework used in the data analysis was appropriate for the system being studied and the case study research method that was used.

CHAPTER VI

RIVERVIEW, A CASE STUDY

Introduction

The purpose of this study was to investigate the decision process used by an elected governmental body in dealing a complex public works proposal. In this study the elected governmental body is a town council. It focuses on how the technical decisions are made in the political environment by looking at the steps in the process, the key players and the factors that affected the outcome

This study should lead to a clearer understanding of what can be done early in the process to improve the transformation of technical information into a decision. This study also explores how engineering studies can be improved to more effectively be used in a political decision process.

The data was analyzed using a sociotechnical systems framework This framework breaks the analysis down into three distinct phases: an environment scan, an analysis of the technical aspects of the process, and an analysis of the social aspects of the process. A sociotechnical system transforms inputs (materials) into outputs (products) through a process. In the case of a town council the input is information, the process is deliberation and the output is decisions or policies (Pava, 1983). The environmental scan attempts to describe the environment or conditions within which the council operates. It is concerned with two levels of influence. The transactional environment includes the town staff and any other entities that not only influence the council but are also

influenced by it (two way influence). The contextual environment includes generally those who influence council but are not directly influenced by it (one way influence).

The environment also includes the inputs and outputs for the decision process which in this case is the information provided to council and the final decision that it makes on the proposal. There may also be intermediate inputs and outputs consisting of questions and responses to clarify issues

The technical analysis focuses on the tools and techniques used by council to reach a decision, along with the issues themselves, and the deliberations that take place. In the case of a town council the structure of the council itself and the rules under which it conducts business are the tools and techniques it uses to reach a decision. Information flow and the deliberations are largely controlled by the rules of order, the freedom of information statute and other rules covering the conduct of official business. The action of the town manager in summarizing information and setting the agenda is also considered a tool used by the council in deliberations.

Issues are the central focus of deliberations. Issues exist in any decision process. There are standing issues such as taxes or quality of town life upon which all topics are evaluated. Others are specific to the topic Input information is evaluated against issues to determine how the town will be affected by the decision. Each council must deliberate a specific set of issues to transform information into decisions or policies. Issues are often the result of influence from the environment.

Deliberations are the process of evaluating input information against issues to transform it into decisions. Intermediate outputs in the form of questions may require supplemental information to complete the deliberation. Deliberations on various issues may take place concurrently or in sequence (Pava, 1983). The output from the individual deliberations form the input for the final decision. Deliberations can take place in a variety of forums and may include interactions with the environment.

The social analysis is used to determine the roles of the various participants in the process. It studies the deliberations to determine how the participants interact to help move them towards resolution. It identifies participants who take the lead in deliberating different issues. A determination is made concerning which issues are important to each participant.

Background

A large metropolitan public utility was asked by the localities in a rural region of the southeastern United States to determine the feasibility of the utility's providing wastewater collection and treatment service to the population centers in the region. The utility responded by assigning a senior engineering manager to establish an office in the rural region to perform the study.

The study was completed and approved by the metropolitan public utility s governance board in February 1996. There were three primary recommendations of the study. First, it recommended forming a separate division within the utility to operate the existing treatment system in the rural region. Second, it recommended that the division be a financially separate cost

center to maintain the localities' eligibility for grants and low interest loans that are only available to small communities. Finally, in order to maintain a level of local control the study proposes the formation of a regional advisory board, comprised of representatives from each of the rural localities, to adopt the rural division's rates and budgets and to set priorities for capital improvements and expansions. Operating costs were estimated to remain low through the use of automation and electronic process monitoring which would keep the need for operating personnel to a minimum.

There were four counties and two towns in the rural region who seriously considered the proposal. (see Table 1, p.4) Only four of them had existing wastewater systems. These systems were relatively small and all of them had to elect to become a part of the rural division to comprise a large enough customer base for the division to be financially viable. The localities without systems could also join the division, but they would not have a vote on the regional advisory board until service was expanded into their areas.

The study concluded that, given enough participants, the rural division would be feasible from both an engineering and a financial standpoint. The final decision for each locality to join the metropolitan public utility and form the rural division rested with the elected officials. The same decision was considered concurrently by six different political bodies. There were many issues that these bodies had to consider. The issue of public opinion concerning growth and local control was different in each of the localities. There was also the matter of its being an election year for some of the elected officials. The issue of regional

cooperation verses independence has also been a continuing issue within the elected bodies and other regional organizations.

The research was built around a case study of two localities making the decision whether or not to join the metropolitan public utility in formation of the rural division. Each locality had been given the same information.

The Riverview Environment

Riverview is an incorporated community with a population of approximately three thousand. It is situated in a relatively rural area of the southeastern United States. It is a town which means that it is part of a larger county. The town and the county share some services. Residents of the town are citizens of both the town and the county. They are represented at the county level by a member on the county board of supervisors. They also pay taxes to both the county and the town.

Riverview is governed at the local level in the town manager form of government. It consists of a town council with members elected at large for four year terms. The mayor is directly elected to act as chair of the council and votes only in tie break situations. He also has veto power. The council employs a town manager or executive to act as secretary of the council and manage the day to day activities of the town.

Regular meetings of the council are held on a monthly basis usually in the evening of the last Monday of every month. The agenda for the meeting is drafted by the town manager and distributed to the council members in advance along with other background information. The meetings are run using a

standard form of parliamentary procedure. Motions require a second which then opens discussion on the issues surrounding the motion. The town has the authority to adopt supplemental rules of order. This town, among others, has adopted a rule that the mayor may only vote on a motion if his vote will result in a tie break The practical implication of this rule is that the mayor rarely votes on any motion.

As with other elected bodies in the state, the Riverview town council is subject to the state's freedom of information statute. This ensures public scrutiny of actions by council. It prescribes that meetings of council, with some exceptions, must be open to the public. A meeting of more than two council members is considered an official act of the council and must, therefore, be advertised in advance and open to the public. The council can, however, discuss personnel or legal matters in private executive sessions, provided that the topic is announced to the public in advance. No votes can be taken during the executive session. The mayor must subsequently certify in public session that only those topics disclosed before the executive session were discussed Any council action that is taken on items discussed in executive session must take place in public session.

Discussions with council members revealed some of the political and social background of this particular council. In my discussions with council members political party labels were never mentioned. In recent elections one of the most vocal council members was defeated. Just before the election he was an outspoken critic of a rather large capital project that the town was planning

In general, the council members had a great deal of concern about how the citizens would react to their decisions. This may be the reaction to the activities in a neighboring locality whose governing board was pressing forward with a large capital project. The members of its governing board seem to fully support the project but there was a great deal of dissent among the locality's citizens. The governing board was receiving criticism in the local newspapers.

There was some influence from the neighboring localities. The town manager interfaces with his counterparts from other localities at regularly scheduled meetings to discuss regional topics. The town was also involved in an effort to develop a small airport, that it owns, into a regional facility. The regional airport had the potential to become a significant revenue source for the town. There were several members of the county board of supervisors who are influential in town. They made it clear that their position was in favor of having both the county and the town part of the metropolitan public utility.

The town manager is an employee of the town and takes direction directly from council. He develops some topics and polls council members for other topics which he compiles for the council meeting agenda. In that role he is in position to influence council by controlling the flow of information. The council relies on him to interpret complex or technical topics that they may not have the expertise to understand. He also apprises them of relevant background information that could affect their decision.

It became clear by, the town manager's actions, that he was not in favor of the proposal to have the town join the metropolitan public utility although he never overtly stated that position.

Another role of the town manager is to interpret and then implement policies enacted by town council. In this position he is often the focal point for citizen complaints about council policy.

Influence flows between the town manager and council in both directions Council enacts policy that influences the town manager's position as the town's operating officer. He, in turn, will attempt to influence council to enact policies that, from his perspective, are in the best interest of the town or make his job easier. These are often conflicting requirements.

Inputs and Outputs of the Deliberations

Initial Input

The deliberations in this study would ultimately result in a decision as to whether or not Riverview should join the metropolitan public utility to provide wastewater collection and treatment on a regional basis. Decisions of this type are very complex and usually involve technical issues. As with most major public works decisions, the chief source of information was an engineering feasibility study report. The study, which looked at operational and financial aspects of setting up a rural division of the metropolitan public utility for the town and the neighboring localities, determined that it was feasible to set up such an division provided that enough localities would participate to make the division financially viable.

The report was made available in either its full edition or in an executive summary. The town manager decided how many of each edition to request and to whom to distribute them. Full versions of the report were on display in the town office for both council members and citizens who wanted to refer to them

The town manager did not perform a detailed interpretation of the information in the report. He did develop a comparison of only the cost estimates included in the report with the town's existing budget for wastewater operations.

The metropolitan public utility's project manager was asked to give a presentation on the proposal at a work session of town council. The town manager was present to explain the proposal from the town's perspective

The utility's project manager suggested that he be allowed to meet with the council members in private to let them ask questions and have some of the issues clarified. The town manager said that he would rather have him meet only with a committee of the council that deals with public works topics The meeting was never set up.

The mayor, two of the council members and the town manager attended a dinner meeting of the regional planning agency which included a presentation on the proposal to form a rural division of the metropolitan public utility. The council members who attended were able to listen to questions asked by officials from other localities and hear what issues the other localities considered important to their deliberations. Council members also had the opportunity to ask questions

of upper management officials of the metropolitan public utility to get a feel for the type of organization they might be dealing with in the future.

There were council members who were also members of regional planning boards and other agencies. These members could interface with council and board members from other localities deliberating on the same proposal and exchange views.

Council members note that for decisions such as these they must rely on expert opinion, either from the town manager or from outsiders, to help them clarify the technical issues. They realize, however, that these experts are oftentimes biased providers of information.

Intermediate Outputs and Inputs

Many of the town council members asked questions, at various times, to clarify issues they were deliberating. Some of the questions were directed to the metropolitan public utility's project manager while others were directed to the town manager. The town manager introduced issues that were not within the scope of the original report. Many of them dealt with intangibles and called for subjective judgments. It was not possible to resolve some of these issues with the information that was available.

During the process, the mayor realized that the town manager may not have been providing the council with objective information. He began to ask the utility's project manager directly for information to provide some balanced input

Final Output

The meeting, where the final deliberations took place and the vote taken, was scheduled to be the regular council meeting. However, other issues on the agenda caused the meeting to run long, so council decided to adjourn and reconvene to discuss the proposal at a luncheon session. Deliberation of the issues took place in executive session, so no direct evidence of those deliberations is available. The council reconvened into public session to vote on a motion to halt further consideration of the proposal.

There were two possible forms of output from the deliberations given the form of the motion. They could have voted in favor of the motion which was to stop further consideration of the proposal. That would have sent a signal to the regional agency that the town was not interested in pursuing the matter further Or, they could have voted against the motion and continued consideration after possibly receiving more information. The motion passed on a vote of three to two of the council members present. The vote did not involve a tie so the mayor did not vote on the motion.

Environment Boundaries

There is no explicit evidence in the case study data to suggest where the boundary is between the council and its environment. However, some initial boundaries can be assumed based or the town's organizational structure The town council is the central core of town government. The town manager is an employee of the town, takes direction from council, and also influences the council. That puts him in what is referred to in sociotechnical systems terms as

the transactional environment (Pava, 1983). The transactional environment is defined as being outside the system but both influencing and being influenced by the system. Groups such as the town's citizens, outside experts and the media would be considered in the "contextual" environment because they influence the council but are not directly influenced by it (Pava, 1983). Of course, in reality everything the council does affects the entire environment to some extent, therefore, it can be argued that there is no contextual environment but only a transactional environment. However, for the purposes of study we assume that both exist because it makes it easier to categorize the actions of individuals. Individuals can move from either environment and back based on the effects of their actions.

An indication of the actual boundaries is evident from the roles of some of the participants and from the activities. Roles that shifted during the deliberations would also indicate a shift in the boundaries. In the beginning the mayor was content to let the town manager control the flow of information. The regional agency's project manager was asked to provide information to the council through the town manager. At that point the project manager was in the contextual environment.

Later on the mayor began to request information directly from the project manager. It could then be argued that the utility's project manager was moved into the transactional environment.

When the council deals with issues in executive session the boundaries are pulled in close, and everyone except the town manager is relegated to the contextual environment.

Tools and Techniques

The tools and techniques used by the town council to transform input information into an output decision reside largely in the structure of council itself and the rules under which it conducts business. Much of the structure is prescribed by the state code and whatever internal rules that the council has set up to conduct business.

Meeting Agenda

The town manager begins the process by setting the agenda for the council meeting. He gets input from the mayor and other council members on topics that they would like to discuss and act on at the council meetings. He also has items of his own to bring up regarding town business and policies. The town manager has a great deal of influence as to the order in which topics are deliberated. In this case the choice of which meetings in which to discuss the proposal and the timing of the public comment periods had much to do with the course of deliberations. One of the council members who reviewed a draft of this document felt that this paragraph overstated the amount of influence that the town manager has on the conduct of town council business.

Conduct of Meetings

The town manager opens the discussion on each agenda topic with a brief statement of his position and what action, if any, he recommends the

council take on the item. Except in rare cases the town manager has a specific recommendation that he would like council to follow. His comments, therefore, cannot be considered to be neutral. His comments probably have a greater affect on those council members who are not well briefed on the topics either because they have not taken the time to read the briefing materials provided or because they have no interest in the topic. In this case the town manager's comments were extremely influential because of councils general lack of knowledge on the subject. A council member also took issue with this paragraph. He felt that the council members were adequately prepared to deal with most topics so that again the town manager's influence was overstated.

The mayor, chair of the council, has some control of the flow of the discussion. This control is limited, however, by the rules and procedures Any council member can use the rules to affect the flow of discussion and the conduct of business.

This particular council prefers to deal with complex topics in dedicated work sessions. The sessions are required to be public but are not well attended by the citizens. The local paper does not seem to cover them either. These work sessions are held during the day which can be inconvenient for some council members.

This council conducts some deliberations in executive sessions. The rules are specific on how executive sessions are to be conducted and what can be discussed during them. The council determined that this topic could legally be discussed in executive session.

The town council does have standing committees to deal with specific subjects such as public works topics. A committee consists of only two council members so that it can meet in private without violating the state's of information statute. Early in the deliberations, the town manager suggested that this topic could be deliberated by a committee to develop a recommendation for action by the full council. However, this never took place.

Citizen Participation

The town council can get public input through the use of public hearings and public comment periods held during council meetings. The town council is legally bound to hold public hearings on certain types of issues. Issues concerning taxes or land use are probably the most common. The rules for the conduct of public hearings are specific and are spelled out in detail in the state code for each topic. The mayor formally opens and closes public hearings and can then entertain motions to take action on the topics.

A public comment period is an informal forum to receive public input. It can be opened and closed by the mayor at any time, and there are no legal requirements that all citizens present be heard. There is also no requirement that the council take action after the public comment session is closed. This council did not choose to schedule any special forum to receive citizen input on this proposal.

Restrictions on Meetings

Regulations, such as the state's freedom of information statute, restrict the way that council members can meet to deliberate on issues. They are

designed to ensure that the public has complete access to the governmental process. The act requires that no more than two council members meet without advertising the meeting in advance and recording minutes. This also applies to council work sessions in which the members meet to discuss issues informally.

Council has the authority to adjourn a meeting to go into private or executive session for discussion of certain issues but is subject to restrictions of the state's freedom of information statute. Executive sessions are usually reserved for issues surrounding active or pending legal action, real estate procurement issues, or personnel matters in which the public "right to know" might conflict with an individuals right to privacy as defined by the state's privacy statute. The mayor must disclose publicly the type of topics that are to be discussed in the executive session. Following the executive session, the mayor and the council must certify that only those items previously disclosed were discussed. Official action on items discussed in executive session must be taken during public session.

Issues

Providing public services is one of the most important and probably one of the largest governmental functions. It is one of the most complex topics that town councils deal with. In public services or utilities cases many of the issues are technical and difficult for some council members to understand. Because they impact the citizens directly, the issues that are deliberated tend to become emotionally charged. Several major issues came to light during Riverview's deliberations on the proposal concerning whether or not to turn over the

operation and maintenance of the town's wastewater facilities to the metropolitan public utility. Not all of them, however, were actually deliberated before the decision vote was taken.

Cost of Service

The cost of service to the customers of Riverview was a major issue for the town council. Much of the public deliberation revolved around the cost or rates issue. The council members felt that they would have a difficult time justifying their decision to the citizens if it resulted in their sewer rates increasing. They were adamant that their decision could not result in a rate increase.

Loss of "Windfall Revenue"

The town has a contract to treat industrial waste that is generated in another locality. This contract results in a large amount of revenue that is used by the town to supplement tax revenues. The town has been able to use these funds to support additional projects. This issue was important because of its impact on the town's overall financial status.

Annexation Potential

Some council members were concerned about how the decision would affect the town's ability to annex more area from the surrounding county Typically, a town will offer to provide utilities and other services to areas that it wants to annex in order to entice the residents in those areas to vote in favor of annexation. If the wastewater facilities were owned and operated by the metropolitan public utility, the town would not have those utilities to offer

Involvement in a Regional Enterprise

There were council members who were concerned about how the town would fair with a regional agency providing a utility service. The town was already involved with a regional solid waste agency but only to the extent that it participated in the establishment of a regional disposal site in another locality They thought that the town would be paying for more than its share of operating costs and subsidizing the cost of wastewater facility operations that the utility would operate in other localities.

The other side of this issue is that by joining the metropolitan public utility the town can take advantage of the growth of the other localities. An increase in the number of customers that the utility serves would spread the its fixed costs over a larger base and reduce the rates in all of the participating localities.

Loss of an Asset

If the town joined the metropolitan public utility, it would have been required to transfer ownership of its wastewater facilities to the utility. Many on town council felt that the facilities were a financial asset and that the town had made an investment to build them. They were afraid that if the facilities were transferred to the utility, free of charge, the town would be losing its investment

Some felt that, because regulatory requirements on the performance of the facilities carry significant penalties, the facilities were actually a liability for the town. They would have been glad to let another agency take the responsibility for their operation and maintenance.

Facility Operation

One council member stated that if the facilities were operated by the metropolitan public utility, there would not be anyone living close by to respond to emergencies during off hours. The utility's plan was to monitor the facilities during off hours, using remote sensing technology and computers that could alert operating personnel to potential problems. Some council members were not comfortable with reliance on automation to aid facility operation and monitor performance.

Town Management

An issue for some was the need for the town to maintain an individual in the town manager's position with the expertise to manage the wastewater facilities. They felt that if the current town manager decided to leave, the town would be able to hire a new town manager at a lower salary if those qualifications were no longer required.

Deliberations

Although deliberations may have taken place in different forums, the researcher only had access to data from deliberations in public forums Of the seven issues identified, six of them were deliberated in public forums where data was being collected. There was very little data available from deliberations in the private forums.

Cost of Service

The cost of service issue was deliberated in public forums. The rates and costs estimated in the report were higher than what the town manager calculated

using the town's budget. Council members voiced concern that they couldn't justify approving a proposal that would cause the town's sewer rate to increase. A comment was also made that the utility's proposal was probably more appropriate for smaller localities because the cost of service would decrease. The issue could not be resolved because any changes in how the utility calculated cost affected all of the localities in the area considering the same proposal. Timing as it was, the rate and cost issue could not be resolved before the council voted to halt consideration on the proposal.

Loss of "Windfall Revenue"

The town was receiving a large amount of revenue from the treatment of the industrial waste. They deliberated what would happen if the town lost the revenue. They discussed whether the town could make up the revenue some other way. The utility's project manager told the mayor in a private discussion that there was only a limited number of ways that the utility could legally handle the industrial waste. He was told that the utility could only charge the industrial customer for the actual cost to treat the waste and that the revenue had to go back into the operating budget. This would result in significantly less revenue than the town had been receiving. Since the funds would go into the utility's rural division operating account, they would not be available for the town to use. This is another issue that could not be resolved satisfactorily in the time available before the vote.

Involvement in a Regional Enterprise

During deliberations some of the council members noted that there were differences between the town and the other localities that would be in the metropolitan public utility's rural division. The other localities are developing because they have land available. The town is almost fully developed. This means that while the other localities will have to expand their existing wastewater facilities or build new ones, the town's existing facilities should be sufficient for the foreseeable future. There was concern that if the town transferred its facilities to the metropolitan public utility that the utility may use the facilities to treat additional wastewater from outside of town. The town had invested in an expansion to assure that it would have adequate capacity They were afraid that the capacity would be used up to benefit other localities and not the town.

The utility's project manager assured them that it was the utility's policy to always provide capacity in excess of all locality needs. He noted that in the report there were future costs included to pay for an expansion of the town's wastewater facilities to replace the capacity utilized by another locality

One of the council members asked why the regional planning agency was supporting the proposal. The town manager replied that it was because the other localities needed wastewater service. He noted that the town started building its wastewater facilities while construction costs were inexpensive Now it is expensive for individual small localities to build their own facilities

independently. Although not resolved to everyone's satisfaction, this issue was not a major factor in the decision.

Facility Operations

One of the council members noted that future regulatory requirements for the wastewater facilities were uncertain. If the government puts tighter restrictions on the performance of the town's wastewater facilities, the town would be forced to upgrade them at considerable cost. The utility's project manager replied that no matter who owned the wastewater treatment facilities, the customers of Riverview would have to pay for part, if not all, of the cost of the improvements.

The same council member was concerned about the capacity of the wastewater treatment facilities. The town manager replied that the wastewater treatment facilities had not yet reached capacity and was meeting all of its performance requirements. The council member said that was true at that time, but there was no way of knowing what future requirements would be. This issue was also not resolved during deliberation, but it did not become a deciding issue either.

Another council member was concerned about the metropolitan public utility's plan to use automation and remote monitoring to operate the facilities. The utility's project manager explained that the automation would be used to hold down costs by making the most efficient use of manpower. The town manager said that the town could also use automation but chose not to so that the facility operators would be forced to observe the facility performance first

hand. The council member said that he was not comfortable with automation because of past experience at a local industry.

Loss of an Asset

The issue of the metropolitan public utility's reimbursing the town for its wastewater facilities was deliberated just before the vote. Data on this deliberation was drawn from the minutes of that meeting. A council member asked why the report did not mention that the town would be reimbursed for the assets. He noted that the town had made substantial investments in the facilities. There was no mention in the minutes if that issue was resolved, but given the timing, it probably was not.

Another council member asked if the metropolitan public utility was going to make a profit. It showed that some of the council members did not understand that the utility was a governmental body and, therefore, non-profit. The town manager, who was familiar with the structure of the metropolitan public utility, apparently did not respond to clarify the issue.

Deliberation Process

In a later interview a council member mentioned that he thought the deliberations stayed within council and that only the town manager influenced them.

Confusion in Deliberations

The deliberations were hampered by confusion in the issues. The most serious of which was confusion over the rates and costs. The rates that were estimated in the report, and the rates the town customers were currently paying

were not directly comparable. There were a number of reasons for the confusion. The rates in the report and the town's rates were based on different average household usage. The report was based on an average value accepted by the federal funding agencies. The town rates used a higher average usage value that was developed empirically. Also, rates in the report included all overhead functions, whereas the town pays for much of the overhead function out of tax revenues not the wastewater service rates. This issue was left unresolved.

One council member later said that it would have been helpful if the report's figures and the town's figures had been shown in the same format Other council members said that they had limited accounting skills and could have used some outside help analyzing the financial information

Before the last deliberation the mayor showed the utility's project manager a briefing paper that the town manager had distributed to the council members There were many inaccuracies that could have been attributed to miscommunication between the utility's project manager and the town manager The utility's project manager attempted to correct the inaccuracies, but unfortunately, the mayor was the only one to have the corrected information before the last deliberation and the decision.

The mayor later said that in deliberations where the utility's project manager was not present, there were many issues left unresolved due to lack of information. Some of these issues could have been clarified by the project

manager if he had been present. The mayor noted that it was probably a mistake not to have him present.

A council member noted that many on the council were uncomfortable discussing complex issues in public. It appears that private briefing sessions with small groups of council members may have been beneficial.

The mayor said that given the confusion that remained on the important issues and the wording of the motion they had to vote on, the council made a correct decision.

Roles in Deliberations

The evidence shows that there was no individual to champion the topic during deliberations. There were, however, council members who were vocal on specific issues.

The mayor was involved in deliberations on rates and costs. He realized that the cost would probably be the deciding issue. He spent a great deal of effort getting the cost issues clarified. Another council member was also trying to get clarification on the cost issues.

The issue concerning the town's losing a financial asset, its wastewater facilities, seemed to involve the most council members.

Only two council members were concerned with the town's future needs and how the decision would affect them. One of those council members was also concerned about how the town would be affected by decisions in the neighboring localities. That council member was also present at the dinner meeting of the regional planning agency.

The data shows that only one council member was concerned about the loss of the windfall revenue, but there must have been others.

Conclusion

This case study narrative was developed from data collected from actual events that transpired during the decision process over the proposal to join the metropolitan public utility. It was analyzed using a modified sociotechnical systems conceptual framework developed by Pava (1983) for use with non-routine office work and refined for use in this case study. The case study narrative was drafted in a structure that utilized the categories that were developed from the conceptual framework for data analysis.

Traditionally sociotechnical systems conceptual frameworks have been used in organizational interventions in efforts combining analysis with work design. One of the research questions for this study concerned the utility of using the modified sociotechnical systems conceptual framework as an analysis method for data analysis in case study research. To be appropriate for case study research, data analyzed using this conceptual framework would have to be capable of being used to develop an accurate case narrative.

The case narrative was drafted and copies were distributed to the mayor and two council members for review. They were asked to make any corrections or comments they deemed appropriate and record them directly on the draft copies. Copies of the rough drafts, given to the participants, are exhibited in Appendix 2. Upon their return there were no substantial inaccuracies noted in the participant's comments. There were some minor items noted, mostly having

to do with town policy and structure, and these were corrected in the edition above. There were also grammatical and typographical errors which were also corrected. One council member made a verbal comment that he did not like the tone of the narrative because it sounded to him like the town was being bashed However, he did not dispute the overall accuracy of the narrative. The mayor, who was also a reviewer, said that he thought the narrative was an accurate representation of the events. Some representative comments that were noted in the returned drafts are listed in Appendix 4. The fact that there were very few inaccuracies reported is evidence that the narrative reflects what the participants felt were the actual events. Their reflection served to verify that the data used to produce the narrative was accurate and is evidence that the conceptual framework used in the data analysis was appropriate for the system being studied and the case study research method that was used.

CHAPTER VII

CASE SUMMARY

Cross Case Analysis

The purpose of the cross case analysis is to compare the case studies. This research was completed as a multiple case study. Each case can stand alone but much was learned by comparing the actions and behaviors of the two towns and relating them to the different outcomes of their respective decision processes. Along the way, implications were developed for the practice of engineering or other technical disciplines when interacting with elected bodies making technical decisions.

As with the data analysis, the conceptual framework used to conduct the cross case analysis was based on sociotechnical systems perspective. That is, the analysis will proceed through the findings of the open system scan followed by the technical subsystem analysis and the social subsystem analysis. Comparisons were made between the environment and subsystems of each town. Interpretations were then drawn about the behavior and the differing outcomes. The cross case analysis and interpretations were drawn from comparative interpretations of similarities and differences in the case narratives and ultimately the case data bases. Also, the analysis was based on the interpretations of the researcher.

The cross case analysis supported development of implications for the use of the results, from a sociotechnical systems based analysis of a political

evaluation process, in the practice of engineering management. These included concepts that can be applied to the formation of technical engineering proposals and how they are submitted for evaluation, and how the efficiency of the evaluation process might be improved.

Contextual Environment

The analysis of the environmental data showed that there was very little citizen involvement in the deliberations on the issues in either town council. The interviews with some of the council members revealed some common characteristics of both towns. Council members in both towns noted that the topic and the issues under deliberation were not the type that generally stir up interest among the citizens. They felt that the citizens did not perceive the issues as ones that would directly affect them.

There was a difference in the amount of coverage the respective local newspapers gave the topic. The evidence does not show that the newspaper coverage made much of a difference in the amount of citizen involvement. Some council members did say that the Riverview paper could have improved citizen involvement if more detail had been published. Others said no, wastewater was not a topic that the citizens could become emotional about. The topic would have generated more interest if it had resulted in immediate effects on the rate or tax structure or if it had somehow affected children, but short of that, the citizens seemed to be content to let the town councils consider it without their input.

One difference that was evident in the cases was the way that the council members felt about their relationship with the citizens. In Watertown the council members represented various constituencies. The issues they were interested in reflected that representation. Some even noted which constituencies they represented. They did not seem concerned about how the citizens would react to their decision because they were certain that their individual views coincided with those of their constituents. In Riverview, however, several of the council members stated their concern about how the citizens would react to them after the decision, especially if it caused their sewer rates to increase even minutely The apparent difference may be explained by the fact that both town councils had just been through an election. In Watertown, all of the council members outlined their positions on various topics in the editorial pages of the local paper just prior to the elections. Most of them stated that they were in favor of having the town join a metropolitan public utility. The fact that they got no public response and were all reelected added to the confidence in their positions.

In Riverview the elections went differently. Just prior to the election the town council deliberated a very contentious issue dealing with the school system. There was much public involvement given that the topic had to do with the town's children. One of the more vocal members of the council, who was against the school topic, was defeated badly in the election. The ramifications were not lost on the council members who were re-elected.

Citizen involvement may or may not be necessary, or even desirable, for every topic that is put before an elected body for a decision. However, the

citizen involvement should have been taken into account earlier in the process. It would have been possible to look into the history of previous topics handled by a particular council to gauge how different types of issues affected the level of citizen involvement and what were potential "hot button" issues. This information could then be used to frame the topic either to encourage or discourage citizen involvement.

Taking elections into account is more difficult. If the timing allows, the best way to deal with elections is to plan for the information to go to the elected body, and the decision process to take place as close to mid term as possible. That would give the officials time enough to get over any problems caused by the last election and yet be far enough ahead of the next election so that their individual popularity would recover if they had to make an unpopular decision. However, timing was not a controllable factor in this case, so the best that could have been done, would have been to frame the topics and issues in a way that it would have caused the least political problems for the elected officials but allowed them to reach a proper decision. That is, a decision that was reached on the merits of the topic being decided.

The decisions being made in both cases involved Watertown and Riverview's joining a metropolitan public utility. At the same time they and other neighboring localities were also involved in other regional enterprises. There was, as noted in the case narratives, a regional solid waste management agency that had been in existence for some time. The localities participated in varying degrees. Some only disposed of the solid waste they collected at a regional

disposal facility. Other localities had the regional agency both collect and transport waste for them. The issues surrounding a regional enterprise were not new and had successfully been deliberated before.

In a locality neighboring Riverview a large agency was planning a water supply to benefit its customers outside the region and the citizens of localities within the region who were participating in the project. This was a controversial project with citizens on both sides of the issue. The town already had a water system and was located some distance from the site of the water supply project. Therefore, the proposal under consideration and the water supply project were not linked in the deliberations.

There was also the matter of a regional correctional authority that was in the process of planning to build new or to expand an existing facility in a locality close to Watertown. Opponents of the facility were citing that the correctional facility would have to increase the size of its wastewater treatment facility which would, therefore, increase the amount of treated wastewater entering the waterway which adjoins Watertown. Others, using the same logic, said that if Watertown and the neighboring locality joined the metropolitan public utility, it would encourage development and further pollute the waterway. This issue was not ultimately convincing for the majority of council members, but the two topics were linked through the common theme of their affect on the adjoining waterway. The issue of waterway pollution took up much of the deliberations because the discussion ranged over the entirety of the linked topics. In determining issues that could find their way into deliberation, the project manager should have

taken into account other topics in the environment that could be linked to his, and planed to provide information that would have kept the topics separated.

Transactional Environment

The most important factor in the transactional environment that affected the decision process was the role of the respective town managers. The two town managers had some characteristics in common. Both were expected to interpret technical or complex information for their respective councils. In both systems they act as focal points for unpopular decisions that the councils made. Neither town manager was above trying to influence council to his point of view Neither town manager could be considered an unbiased source of information. There were, however, some distinctions. The town manager of Watertown was actively promoting the concept of joining the metropolitan public utility as good for both the town and the other localities in the region. The town manager of Riverview, while cooperative about providing information, was outwardly neutral towards the proposal. The town manager of Watertown produced very detailed briefing papers to interpret information and clarify issues before deliberations began. The town manager of Riverview produced only a simple comparison of estimated costs, explained the existing town operation and responded to questions during the deliberations. The project manager for the metropolitan public utility was asked by the town manager of Watertown to give the council members individual briefings in private. When the project manager asked the town manager of Riverview if this would be helpful in his town, he replied that he would set up a meeting with the council's public works committee but he never

followed through. The town manager of Riverview limited the project manager's access to work sessions of the entire council where he was present to set the tone of the discussion.

It was learned, from studying the town mangers, that town councils rely on them as their primary source of credible information. Town managers will frame the input of information to suit their view of the topic. This means for a project manager, that without the town manager's support, it is almost impossible to move an issue through the decision process successfully. The town manager must buy into the proposal early and preferably have input into the proposal's development.

Inputs and Outputs

In Watertown the council had initial input information in the form of both the feasibility study report and the town manager's briefing papers explaining the report. The Watertown manager attempted to deal with as many issues as possible in the briefing papers and in discussions with council members before they began public deliberations. Thus, the actual number of issues that had to be deliberated in public was kept to a minimum. There were a few related issues that were brought up during the public session by one council member. However, because both the town manager and the project manager had private discussions with the council members, they were both aware of the issues that would be deliberated and were prepared to support those deliberations with additional input if required.

The Riverview council only had the report as initial input information. The town manager of Riverview did attempt to give an explanation verbally during a full session of council.

In Riverview the town manager, as well as council, brought up their issues during the deliberations. The information was not available to answer questions that came up either because they were beyond the scope of the original study or because the project manager was not present to clarify the information in the report.

The form of output was different between the towns. In Watertown, the manager submitted a letter for approval to the town council that would commit the town to moving towards joining the metropolitan public utility. The motion voted on was to receive a "yes" to send the letter or "no" to not send it. Clearly a vote "yes" was in favor of the proposal and a vote "no" opposed it.

In Riverview the manager did not recommend an action. There was still confusion on many of the issues, and without more information forthcoming, one council member made a motion that the town council drop the proposal from consideration. In this case the decision was not actually based on the merits of the proposal but on merits of continuing the decision process. The decision process was abandoned, and the proposal rejected before the deliberations could be completed.

Deliberations

Many issues were brought up, but only a few of those were actually deliberated. Of them, the rates and costs issue was probably deliberated the

most. It was also the issue that the citizens would have been vocal about if there had been some citizen involvement. In Watertown this issue was largely resolved before deliberation began. The town manager's briefing papers laid out the rates' issue clearly, such that the council members could see the effects their decision would have on how much their constituents would have to pay for wastewater service under the metropolitan public utility. With the rates estimated to be the same or lower, the issue was resolved quickly to the satisfaction of most of the council members.

In Riverview, the rates and costs' issue was never really clarified. The town manager's interpretations were not available to the council members until deliberations started. They were also produced in a format such that the values from the feasibility study report were not directly comparable to the town's own budget values. This issue was never resolved in Riverview during the case study time period.

Another issue that was brought up in both towns and received some deliberation was the idea that the town would be involved in a regional enterprise. In Watertown most of the council members thought that having a regional enterprise handle the wastewater services for the town would be good for the town's future. One council member and a small number of citizens had a different perspective on the regional issue. They argued that if Watertown joined a regional enterprise, it would lead to the neighboring locality's also joining. This would encourage development and ruin the lifestyle in the area. Their issue was framed as how their town's actions would affect others. The

other council members, who were in the majority, looked at all of the issues in terms of how they would affect the town. Their perception was that being involved in regional enterprise would help the town.

In Riverview the regional issue had a different flavor. There were some council members who were concerned about how the town would be treated in a regional enterprise. They did not want the town to become dependent on the other localities. They were also skeptical about loosing control of the facilities that the town's citizens had been paying for over the years.

The difference between the two towns was in how they viewed themselves. Watertown saw itself as a small community that would probably not grow appreciably. The town manager and the council had been trying to simplify the town's government. They entered into agreements with neighboring localities to share services in order to reduce the size of the town staff. On the other hand, Riverview saw itself as a growing community. It had been increasing the size of its government and adding services. It wanted to attract industrial development and annex more area to increase its tax base. They were afraid that giving up control of their utilities would limit their ability to annex or use the utilities to attract new industries. They were also concerned about being dependent on other localities. When developing proposals, it is important to understand the locality's view of itself to better predict the issues that will be used in the decision process and their response to those issues.

Unresolved Issues and Confusion

In Watertown the overall rate and cost issue was resolved early in the deliberations. There was, however, another issue related to rates and costs that went unresolved. The issue was introduced by one council member who wanted the metropolitan public utility to guarantee that the rates would not increase. There was a fair amount of deliberation on the topic, and the issue was resolved to the satisfaction of all but that council member. There were also some other issues along the same line that the particular council member brought into the deliberations including autonomy and control, the veto issue, and the loss of a financial asset. The other council members felt those issues were either resolved or not relevant. In the end the one council member was the sole vote against the proposal.

In Riverview there was much confusion over the rates and cost issue. The cost estimates shown in the feasibility study report were not based on the same assumptions or in the same format as those of the town budget. The town manager and the project manager attempted to verbally explain the differences, but they could not eliminate the confusion. The decision process moved forward with this important issue unresolved in the minds of almost all of the council members.

Important issues must be resolved for there to be a proper decision on a topic. In Watertown, where the majority of the council members felt that the important issues were resolved, they were comfortable voting directly on the proposal. In Riverview, where the decision process moved ahead with many

important issues unresolved, the decision was unclear. There was a vote to suspend or continue consideration of the proposal. A vote in favor of the motion suspended consideration. A vote against the motion would have only extended the deliberations. It would not have been a vote in favor of the merits of the proposal. Deliberations must continue until all of the important issues are resolved for there to be a decision on the merits of a proposal.

Topic Champions and Leaders

For Watertown the town manager became a champion of the topic very early in the process. He worked to reduce the number of issues that had to be deliberated to make a decision. Through briefings and other support information, he clarified the remaining issues. The reduction and clarification of issues resulted in focused deliberations and a smooth decision process which resulted in a vote on the merits of the proposal.

Without a champion from the beginning, the issues in the Riverview deliberations were not easily clarified. The number of unresolved issues was not reduced through the process. Towards the end, the mayor attempted to lead the council through the issues, but the process was too far along, and he was not able to significantly clarify enough of the issues to reduce the councils confusion. A topic champion or leader is essential to track the issues through the decision and provide additional information in a timely fashion to resolve the major issues.

Summary

Throughout the cross case analysis, implications were developed for the practice of engineering or other technical disciplines when interacting with elected bodies making technical decisions. The cross case analysis also supported development of implications for using the results of a sociotechnical systems based analysis of a political evaluation process for the practice of engineering management. These included concepts that can be applied for technical engineering proposals and their submission to elected bodies for evaluation. They suggest actions that can be taken before and during the proposal evaluation process to improve its efficiency and the likelihood of approval. (see Appendix 8) They should also improve the general competency of engineers when operating in political environments. This is an area where an important part of their work takes place, but one in which they have had no formal education.

CHAPTER VIII

CONCLUSIONS AND IMPLICATIONS

Introduction

The research was more than just a study of two different approval processes. It was also intended to extend sociotechnical systems methods for use in non-traditional areas. Governmental agencies function much like private agencies in many respects. Had the boundaries of the systems under study been established to encompass the entire governmental structure, along with all functional departments, the focus of the studies would have been different and more amenable to conventional sociotechnical systems methods. Decisions from the town councils could have been analyzed simply as input to the overall system. Sharpening the focus to the elected body changed the type of process being analyzed from a conventional, almost linear, system to a non-linear system more akin to Pava's non-routine work systems (Pava, 1983), and it exhibited a higher degree of Jackson's (1991) notion of a complex system.

This chapter will discuss the applicability of a sociotechnical systems perspective as an analysis framework for research in general and implications for the use of sociotechnical system methods for studying governmental systems in particular. It will also discuss some practical implications which stemmed fromthe research of how best to work with an elected body involved in a decision regarding a complex technical proposal. Finally, it will touch on the utility of

sociotechnical systems methods when used with these types of systems and some possible areas for future research.

Sociotechnical Systems as an Analysis Framework

Traditional sociotechnical systems methods were developed as techniques to use in organizational interventions. The methods included both organizational analysis as well as redesign tools. As originally developed, they were used on linear systems where the transformation of inputs into outputs was easily traceable and took place in more or less a sequential manner.

This research used sociotechnical systems methods only as a data analysis method for data with which to develop case studies. There was no intervention intended beyond that which the participants learned from reading the case narratives. The sociotechnical system analysis conceptual framework provided a detailed account of the system being studied. Traditional sociotechnical systems methods have been successfully used in modeling conventional, linear work systems in advance of organizational restructuring or job redesign efforts (Cummings, 1978; Fox, 1995). With some modifications of the methods used, Pava (1983) showed how a sociotechnical systems framework could be used in unconventional, non-linear, work systems in an office setting. With further interpretations, this research successfully adapted sociotechnical systems for use as a framework for analyzing a nonlinear decision process of an elected governmental body.

The sociotechnical systems conceptual framework, when used as an analysis framework, provided an organized method to investigate the processes

that took place within the system. It allowed the researcher to investigate the complex relationships between the environment and the system. In the cases studied for this research, the systems were formally linked to their environment.

Sociotechnical systems methods also provided a framework to investigate how the participants used the tools and techniques available to them to transform input into output. It also took into account the complex relationships between the participants and between the participants and the technology. The analysis resulted in case study narratives that were found to be accurate when reviewed by actual participants in the decision processes being studied

The fundamental sociotechnical systems concepts have proven applicable to many different organizational systems. This research demonstrated that applying sociotechnical systems to increasingly non-linear systems required that only the analysis methods be interpreted within the original conceptual framework. The utility of sociotechnical systems as an analysis framework for understanding, short of intervention, was also demonstrated through the case studies.

Implications for the Applicability of Sociotechnical Systems Methods to Governmental Organizations

The research has shown that the sociotechnical systems framework is adaptable for use with elected governmental bodies. The open systems approach allowed the analysis to take into account the affect of the environment In general, as a system becomes more open, the environment exerts greater influence on it. By definition, a democratic governmental body must be an open

system. The system is designed to interact with the environment in a prescribed manner to guarantee that the system cannot ignore its influence. There are formal methods for the environment to modify or to adjust the system if it is not performing to the environment's satisfaction.

An elected body is open to information. In addition to information in the conventional sense, an elected body is also open to information or influence in terms of election results. The work of an elected body is to transform input information into an output in the form of decisions or policies. The structure of the elected body and regulations prescribe formal ways in which input comes into the system. However, because of the extreme openness of the system, it is accessible to input from many other sources in the environment. Because of the nature of the work they do, elected governmental bodies must be open to information.

To determine the degree to which an elected governmental body is amenable to sociotechnical systems analysis, a preliminary system scan can be performed to ascertain its degree of openness. A primary source for the scan is newspaper accounts of past activities and possibly minutes from past meetings If the system is found to have a history of attempting to isolate itself from its environment, then it will probably be difficult to gather data from that particular system and make sociotechnical systems methods difficult to use.

Another central characteristic of sociotechnical systems is the capacity for self-regulation through feedback. Elected bodies, because of their extraordinary openness, have many sources of feedback. They can accept some voluntarily

but with others they have no choice but to accept or run the risk of being dissolved. They get direct feedback from their constituents in public forums They can also get feedback through the public media. Elected bodies may search for feedback in the form of polling results or by purposely scheduling public hearings or comment periods on specific topics. Of course, the ultimate feedback for an elected body is election results. For better or worse, elected bodies do respond to feedback either from their constituents or from higher level governmental bodies. Feedback and the degree of self-regulation are closely related to the systems degree of openness. Investigating one will also uncover evidence of the other. An elected body that exhibits those characteristics is amenable to analysis using a sociotechnical systems conceptual framework.

The case study data for the technical subsystem was analyzed using the conceptual framework that Pava developed for non-routine office work with some with some slight interpretations. In this framework the transformation process was analyzed as deliberations on the input information with respect to issues. The input information was in the form of a topic or proposal for consideration The proposal for these cases was a common public works proposal and was presented in the form of a feasibility study report and oral presentations to the elected bodies. The issues that were deliberated with respect to the proposal included standing issues that the elected bodies used for virtually all topics. issues that are specific to the topic and some issues which developed from the environment. Members resolved issues on which they could reach consensus The consensus could either be for or against the topic. Issues left unresolved

were a source of confusion which is akin to variance in a conventional sociotechnical systems conceptual framework. When elected bodies had very few unresolved issues, and therefore little confusion, they could then make a decision on the merits of the proposal. When there were many unresolved issues and confusion, the decision was made on the merit of continuing the decision process, not on the proposal. The quality of the decision made by an elected body is equivalent to the quality of an output product from a conventional sociotechnical system. And, likewise, the amount of confusion in the decision process of an elected body is equivalent to the amount of variance of a conventional system. The sociotechnical systems framework is appropriate for a non-conventional system as long as variables equivalent to a conventional system can be identified.

The tools and techniques used in elected governmental bodies are similar to those identified by Pava (1983) for non-routine office work. However, elected bodies, by virtue of their structure, have more formalized tools and techniques This is an advantage when studying multiple elected bodies because their transformation processes are directly comparable.

The case studies investigated the roles of various participants in the decision processes. This analysis was used to determine if there were leaders in deliberating specific issues or an overall champion for the topic. Analysis of this type is useful for determining the best place in the system to introduce input information.

Weaknesses in Sociotechnical Systems Theory With Respect to Nonlinear Systems

Sociotechnical systems theory assumes that the social subsystem possesses a unity of purpose (Jackson, 1991). This may be a valid assumption for conventional systems with linear transformation processes. However, as systems become more complex and nonlinear the participants are less likely to have unity of purpose for a number of reasons. First, in the case of an elected governmental body, each participant has a constituency. This forces the body to divide its loyalties between their individual constituency and the common purposes. Second, they each may have personal agendas to advance their political self-interest. Most want to be reelected and possibly want to pursue higher political office in the future. In effect, assumptions of unity of purpose in elected governmental bodies is tenuous.

Pava (1983) recognized a similar issue, that he termed vocational separatism, as a possible problem with management and professionals' performing non-routine office work. He dealt with it by using the concept of discretionary coalitions which are temporarily formed over specific issues during deliberations. This implies that the participant have the opportunity to meet informally to form these coalitions. While this is possible for members of an elected body, it is more difficult for the members of small local bodies of the kind in this study. These bodies only periodically meet as a group (once per month) Although some special work sessions are scheduled, these are infrequent The state's freedom of information statute also restricts how they can meet on an

informal basis. Unity of purpose cannot be assumed for the participants in these types of sociotechnical systems.

Traditional sociotechnical systems analysis and design have evolved a set of standard procedures. Some proponents of sociotechnical systems have claimed that its success is due, in part, to the fact that the methods used are standardized such that they can be used by any competent manager or consultant (Fox, 1995). These procedures were designed around systems with linear transformation processes. There are still many organizations for which that model is appropriate. However, there are increasing numbers of unconventional organizations that perform information related work with nonlinear processes. The traditional sociotechnical systems methods are not well suited analysis of unconventional organizations and work systems.

Traditional sociotechnical systems analysis attempts to quantify variance through the use of a variance matrix. As systems become more nonlinear, it becomes more difficult to identify specific instances of variance. As with the examples in the case studies, confusion becomes a factor equivalent to traditional variance but not applicable for use in a traditional variance matrix.

Another traditional sociotechnical systems method is to develop a flowchart of the transformation processes. This is readily applicable to a linear transformation process but very difficult to produce for a non-linear system in which complexities in the transformation processes make their articulation speculative.

Traditional sociotechnical systems methodology relies on detailed information from the organization in order to perform analysis and to redesign using the standard procedures. The information needed to produce the variance matrices, role networks and the use of other standard sociotechnical systems tools may not be available to a researcher in some instances. The case study method, in conjunction with the modified sociotechnical systems framework for nonlinear systems, may allow research to be accomplished on systems for which access problems would inhibit traditional sociotechnical systems methods.

Directions for Future Research

In case study research, individual cases provide evidence to support more general propositions. In order to further generalize the results beyond the immediate context of these two cases, more case studies must be performed on similar elected bodies. Along those same lines, in order to generalize the results over a broader range of sociotechnical systems, similar studies should be attempted on other types of non-linear systems in non-traditional settings.

Other types of non-linear systems may have transformation processes that require different methods of analysis. Research should be conducted in an attempt to further modify or extend the sociotechnical systems framework to suit these systems. Sociotechnical systems methods should also be extended to meet the original goal of work redesign for non-linear and non-traditional systems beyond those applicable to Pava's (1983) methods. A possibility for this type of intervention would be to apply these techniques to government restructuring. On a more practical level, however, this type of intervention could

help a locality decide whether its current governmental structure is appropriate or whether or not an alternate form would result in a more efficient system.

Another potential avenue of research is the development of a process that would assist practicing engineers in engaging with elected bodies concerning technical proposals. Although these cases have some implications for engineering practice, additional work needs to be completed in this area.

Summary

A number of conclusions can be reached with respect to the study and the research questions. These conclusions provide insight for both the use of sociotechnical systems as a research approach and for the practice of engineering in the public environment.

Pava's work with non-routine office settings provided the basis for the framework with which this study was conducted (Pava, 1983). Pava found that sociotechnical systems could be used with non-routine office work by modifying the analysis methods used while remaining within the fundamental sociotechnical systems conceptual framework. He did this by selecting variables that were specific to the type of system he was investigating but had roles that were equivalent to those found in conventional sociotechnical systems applications. An example of this was his use of deliberation as a surrogate for a physical transformation process in a conventional system. His same procedure was applicable to this study. It was possible to use deliberation, with only slight interpretation, and remain within the overall sociotechnical systems conceptual

framework. The sociotechnical systems conceptual framework can be used with non-linear systems as long as appropriate surrogate variables can be identified

This study did not find the limits of sociotechnical systems applicability With similar modifications sociotechnical systems can be applied as an analysis method and intervention tool for other current and future non-linear systems. The methods may evolve, but the overarching sociotechnical systems conceptual framework will remain viable as long as the fundamental sociotechnical systems principals are followed.

The study found that the elected bodies must receive information that is clear and at their level of understanding. In most cases technical or complex information has to be interpreted before it can be processed by the elected bodies. Once the input information is understandable, the members of the body can then evaluate it against issues in deliberations. The body must reach some conclusion on an issue for it to be resolved. Confusion, which was used as the surrogate for variance, enters the process because of incompatible, incomplete or missing information. If all of the issues are resolved, one way or another, then the body can reach an informed consensus and finally a decision on the merits of the overall topic. If there are too many issues, or if important issues remain unresolved, the body cannot reach consensus on the topic. A body that has consensus on the overall topic can either go on to reach either a favorable or unfavorable decision. However, a favorable decision can only come from consensus. If consensus is not reached, then the body will either decide unfavorably on the topic or decide to halt the process.

The elected body must have open access to clear and understandable information for the transformation processes to reach conclusion. Tools such as identifying a topic champion or leader to interpret the information and private briefings for members of the elected bodies have been shown to be helpful by this study.

The study also resulted in the development of other implications for engineering practice in the local governmental setting. These are detailed in Appendix 8.

REFERENCE LIST

Cherns, A., "The Principles of Sociotechnical Design." *Human Relations*, 29:8 (1976), pp. 783-792.

Chisholm, R.F., and J.T. Ziegenfuss, "A Review of Applications of the Sociotechnical Systems Approach to Health Care Organizations." *Journal of Applied Behavioral Science*. 22:(August 1986), pp. 315-327.

Cummings, T.G. , "Sociotechnical Experimentation: A Review of Sixteen Studies." In Pasmore W.A., and J.J. Sherwood, ed., *Sociotechnical Systems: A Source Book*. San Diego: University Associates. (1978), pp 259-270.

Davis, L.E., "Optimizing Organization-Plant Design: A Complementary Structure for Technical and Social Systems." *Organizational Dynamics*. 8:(Autumn,1979), pp. 2-15.

Denzin, N., and Y. Lincoln, *Handbook of Qualitative Research*, Thousand Oaks. California: Sage (1994).

Emery, F.E., and E.L. Trist, "Analytical Model for Sociotechnical Systems". In Pasmore, W.A., and J.J Sherwood, ed., *Sociotechnical Systems: A Source Book,* San Diego: University Associates. (1978), pp. 120-131.

Fox, W.M., "Sociotechnical System Principles and Guidelines: Past and Present." *Journal of Applied Behavioral Science*. 31: (March 1995), pp 91-105.

Guba, E.G., and Y.S. Lincoln, *Effective Evaluation*, San Francisco: Jossey-Bass, (1981).

Herbst, P.G., *Socio-technical Design, Strategies in Multidisciplinary Research*, London: Tavistock (1974).

Isaac, S., and W.B.Michael, *Handbook in Research and Evaluation*, 2d ed. San Diego: EDITS Publisher (1981).

Jackson, M.C., *Systems Methodology for the Management Sciences* , New York: Plenum (1991).

Keating, C.B., "A Computer-Based Strategy to Facilitate Organizational Learning Process." Doctoral Dissertation, Old Dominion University (1993)

Keen, P.G.W., and M.S. Morton, *Decision Support Systems: An Organizational Perspective*, Reading, Massachusetts: Addison-Wesley (1978).

Kelly, J.E., "A Reappraisal of Sociotechnical Systems Theory." *Human Relations*. 31: (December 1978), pp. 1069-1099.

Kerlinger, F.N., *Foundations of Behavioral Research*, New York: Holt, Rinehart and Winston (1986).

Kiggundu, M.N., "Limitations to the Application of Sociotechnical Systems in Developing Countries." *Journal of Applied Behavioral Science*. 22:(August 1986), pp. 341-353.

Kolodny, H.F., and B. Dresner, " Linking Arrangements and New Work Designs." *Organizational Dynamics*. 14:(Winter 1986), pp. 33-51.

Kolodny, H.F., and M.N. Kiggundu, "Towards the Development of a Sociotechnical Systems Model in Woodlands Mechanical Harvesting." *Human Relations*. 33:(September 1980), pp. 623-645.

Lewin, K., " Action Research and Minority Problems." *Journal of Social Issues*. 2: (1946), pp. 34-46.

Marshall, C., and G.B. Rossman, *Designing Qualitative Research*. Newbury Park, California: Sage (1989).

Maxwell, J.A., *Qualitative Research Design: An Interactive Approach*. Thousand Oaks, California: Sage (1996).

Messick, S., "Validity", In Linn, R.L., ed., *Educational Measurement*. New York: Macmillan (1989), pp. 13-103.

Miles, M., and M. Huberman, *Qualitative Data Analysis: A Source Book of New Methods*. Beverly Hills: Sage (1984).

Mumford, E., and Wier, M., *Computer System in Work Design: The Ethics Method*. New York: Wiley (1979).

Orum, A.M.,J.R. Feagin, and G. Sjoberg., "The Nature of the Case Study." In Feagin, J.R., A.M. Orum, and Sjoberg, ed, *Introduction: A Case for the Case Study*. Chapel Hill, N.C.: University of North Carolina Press (1991)

Osborn, S.M., "Performance Management: Paradigm Shift as a Factor in Diffusion of the Sociotechnical Systems Approach." Doctoral Dissertation, The Fielding Institute (1990).

Pasmore, W.A.,, *Designing Effective Organizations: The Sociotechnical Systems Perspective*. New York: John Wiley & Sons (1988).

Pasmore, W.A., "Social Science Transformed: The Socio-Technical Perspective." *Human Relations*. 48 (January 1995), pp. 1-21

Pasmore, W., C. Francis, J. Haldeman, and A. Shani., "Sociotechnical Systems A North American Reflection on Empirical Studies of the Seventies " *Human Relations*. 35: (1982), pp. 1179-1204.

Pasmore, W.A., and G.S. Khalsa., "The Contributions of Eric Trist to the Social Engagement of Social Science." *The Academy of Management Review.* 18: (July 1993), pp. 546-569.

Pasmore, W., J. Petee, and R. Bastian., "Sociotechnical Systems in Health Care: A Field Experiment." *Journal of Applied Behavioral Science.* 22: (August 1986), pp. 392-339.

Patton, M.Q., *Qualitative Evaluation Methods.* Beverly Hills: Sage (1980).

Patton, M.Q., *Qualitative Evaluation Methods.* 2d ed. Beverly Hills: Sage (1986)

Patton, M.Q., *Qualitative Evaluation Methods.* 3d ed. Newbury Park, CA: Sage (1990).

Pava, H.P., *Managing New Office Technology.* New York: The Free Press (1983).

Pava, C., "Redesigning Sociotechnical System Design: Concepts and Methods for the 1990's." *Journal of Applied Behavioral Science.* 22: (August 1986), pp. 201-221.

Peshkin, A., "Understanding Complexity." *Anthropology and Education Quarterly.* 19: (December 1988), pp. 416-424.

Poplin, M.S., "Self-Imposed Blindness: The Scientific Method in Education." *RASE-Remedial and Special Education.* 8: (November/December 1987), pp. 31-37.

Potter, J.W., *An Analysis of Thinking and Research About Qualitative Methods.* Mawwah, NJ: Lawrence Erlbaum Associates (1996).

Sandelowski, M., "The Problem of Rigor in Qualitative Research." *Advances in Nursing Science.* 8: (April 1986), pp. 27-37.

Searight, H.R., "Psychology's Neglected Child." *Journal of Social Behavior and Personality.* 4: (1989) pp. 1-16.

Shani A.B., and J.A. Sena., "Information Technology and the Integration of Change: Sociotechnical System Approach." *Journal of Applied Behavioral Science.* 30: (June 1994), pp. 247-270.

Shoonhoven, C.L., "Sociotechnical Considerations for the Development of the Space Station: Autonomy and the Human Element in Space." *Journal of Applied Behavioral Science.* 22: (August 1986), pp. 271-286.

Sitter, L.U., and J.F. Herzog., "Simple Organizations, Complex Jobs: The Dutch Sociotechnical Approach." Paper presented at the annual meetings of *The Academy of Management.* San Francisco: (August 12-15, 1990)

Smith, L., "An Evolving Logic of Participate Observation, Educational Ethnography, and Other Case Studies." In Shulman L., ed., *Review of Research in Education.* Itasca, IL: F.E. Peacock (1979), pp. 316-377.

Sjoberg, G.N. Williams, T.R. Vaughan, A.F. Sjoberg., "The Case Study Approach in Social Research: Basic Methodological Issues." In Feagin, J.R., A.M. Orum, and Sjoberg, ed., *Introduction: A Case for the Case Study* Chapel Hill, NC: University of North Carolina Press (1991).

Stake, R.E., "Case Studies." In Norman K., and Yvonne S. Lincoln, ed., *Handbook of Qualitative Research.* Thousand Oaks, CA: (1994).

Stake, R.E., *The Art of Case Study Research.* Thousand Oaks, CA: Sage (1995).

Steier, F., ed., *Research and Reflexivity.* Newbury Park, CA: Sage (1993).

Strass, A., and J. Corbin. *Basics of Qualitative Research.* Newbury Park, CA: Sage (1990).

Susman, G.I., and R.B. Chase., "A Sociotechnical Analysis of the Integrated Factory." *Journal of Applied Behavioral Science.* 22: (August), pp. 257-270

Taylor, J.C., "Long-Term Sociotechnical Systems Change in a Computer Operations Department." *Journal of Applied Behavioral Sciences.* 22: (August 1986), pp. 303-313.

Taylor, J.C., and D.F. Felton. *Performance by Design: Sociotechnical Systems in North America.* Englewood Cliffs, NJ: Prentice Hall (1993).

Trist, E.L., *The Evolution of Socio-Technical Systems: A Conceptual Framework* Toronto: Quality of Work Life Centre, Ontario Ministry of Labour (1980)

Trist, E.L., and K.W. Bamforth., "Some Social and Psychological Consequences of the Longwall Method of Goal-Getting. *Human Relations.* 4: (1951), pp. 6-24, 37-38.

Walton, R.E., "How to Counter Alienation in the Plant." In Pasmore, W.A., and J.J. Sherwood, ed., *Sociotechnical Systems: A Source Book.* San Diego University Associates (1978).

Whitt, E.J. "Artful Science: A Primer on Qualitative Research Methods *Sociological Forum.* 4 (September 1991), pp. 367-385.

Yin, R.K., *Case Study Research: Design and Methods.* Thousand Oaks, CA: Sage (1994).

APPENDIX 1

WATERTOWN CASE STUDY
REVIEW DRAFT

The following is the draft version of the Watertown case study narrative that was given to selected officials of Watertown for their review and comment. It contains typographical errors, inaccuracies and omissions that were subsequently corrected following the review process. The corrected version is included as Chapter V.

Watertown, a Case Study

Introduction

The purpose of this study was to investigate the decision process used by one small locality in dealing with complex issues. It focuses on how the technical decisions are made in the political environment by looking at the steps in the process, the key players and what factors affected the outcome.

This study should lead to a clearer understanding of what can be done early in the process to improve the transformation of information into a decision. In the case of engineering studies, how can they be performed such that they lend themselves more easily to a political decision process.

The data was analyzed using a sociotechnical systems framework. This framework breaks the analysis down into three distinct phases, an environment scan, an analysis of the technical aspects of the process, and an analysis of the social aspects of the process. A sociotechnical system transforms inputs (materials) into outputs (products) through a process. In the case of a town

council the input is information, the process is deliberation and the output is decisions or policies.

The environmental scan attempts to describe the environment or conditions within which the council operates. It is concerned with two levels of influence The transactional environment includes the town staff and any other entities that not only influence the council but are also influenced by it (two way influence) The contextual environment includes generally those who influence council but are not directly influenced by it (one way influence).

The environment also includes the inputs and outputs to the decision process which in this case are considered to be information provided to council and the final decision that it makes on the issue. There may also be intermediate inputs and outputs consisting of questions and responses to clarify issues

The technical analysis focuses on the tools and techniques used by council reach a decision, along with the issues themselves, and the deliberations that took place.

In the case of a town council the structure of the council itself and the rules under which it conducts business are the tools and techniques it uses to come to a decision. Information flow and the deliberations are largely controlled by the rules of order, the Freedom of Information Act and other rules covering the

conduct of official business. The action of the town manager in summarizing information and setting the agenda may also be considered tools used by the council in deliberations.

Issues are the central focus of deliberations. In any decision process the issues may exist (standing issues such as taxes or autonomy) or they may come from input information and are specific to a particular decision. Input information is applied to issues to determine how they will be affected by a decision. Each council must deliberate a specific set of issues to transform information into decisions or policies. Issues are often the result of influence from the environment.

Deliberations are the process of applying input information to issues to transform it into decisions. Intermediate outputs in the form of questions may require supplemental information to complete the deliberation. Deliberations on various issues may take place concurrently or in sequence The output from the individual deliberation form the input for the final decision. Deliberations can take place in a variety of forums and may include interactions with the environment.

The social analysis is used to determine the roles of the various participants in the process. It looks at the deliberations to determine how the participants interact to help move the deliberations along. It identifies participants who took

the lead in deliberation the different issues. A determination can be made of which issues are important to each participant.

The Watertown Environment

Watertown is an incorporated community of approximately one thousand population. It is situated in a relatively rural area of [the southeastern United States]. It is a town which means that it is part of a larger county. The town and the county share some services. Residents of the town are citizens of both the town and the county. They are represented at the county level by a member on the county board of supervisors. They also pay taxes to both the county and

Watertown is governed at the local level in the town manager form of government. It consists of a town council with members elected at large for 2 year terms. The mayor is directly elected to act as chair of the council, votes only in tie break situations and does not have veto power. The council employs a town manager or executive to act as secretary of the council and manage the day to day activities of the town.

Regular meetings of the council are held on a monthly basis usually in the evening of the third Monday of every month. The agenda for the meeting is drafted by the town manager and distributed to the council members in advance along with other background information. The meetings are run using a standard form of parliamentary procedure. Typically motions require a second

which then opens discussion on the issues surrounding the motion. A motion and a vote are required to then close discussion and put the original motion to a vote (call the question). The town has the authority to adopt supplemental the rules of order. This town, among others, has adopted a rule that the mayor may only vote on a motion if his vote will result in a tie break The practical implication of this rule is that the mayor rarely votes on any motion.

As with other elected bodies in [the state], the Watertown town council is subject to the Freedom of Information Act. The ensures public scrutiny of actions by council. It prescribes that meetings of council, with some exceptions, must be open to the public. A meeting of more than two council members is considered an official act of the council and must therefore be advertised in advance and open to the public. The council can, however, discuss personnel or legal matters in private, often called executive session, provided that the topic is announced in public in advance. No votes can be taken during the executive session. The mayor must subsequently certify in public session that only those topics disclosed before the executive session were discussed. Any council action that is taken on items discussed in executive session must take place in public session.

Discussions with council members revealed some of the political and social background of this particular council. The decision of an individual to run for town council is often more social than political. A person who runs will tend to

represent a social constituency rather than a political party. In my discussions with council members political party labels only came up in reference to one individual who's view were seen as keeping strictly with the ideology of a particular political party. One council person mentioned that the decision whether or not to run may be based on the probably of loosing the election rather than winning. A defeat would cause a loss of prestige in the community and alter ones social status.

Throughout the deliberations there was little or no citizen involvement. When asked if this was typical, council members replied that in general the citizens will respond to issues they perceive will impact them directly. Education and taxes are examples of issues that will elicit citizen involvement. Citizens will tend to react emotionally to issues such as these.

The town has a local weekly newspaper. The paper ran a series of articles on the project that described the project in detail and discussed many of the issues The paper also covered the activities in other neighboring localities as they went through similar deliberations.

There is some influence from neighboring localities. The town manager interfaces with his counterparts in other localities on a regular basis There are owners of businesses in town who reside outside of town that are influential in town affairs since the taxes on their businesses are a significant part of the

town's revenue base. Some citizens are concerned about the affect the town's decision will have on the neighboring locality.

At the same time the issues project were being deliberated there were other regional initiatives being deliberated. All of the localities in the area are part of a regional corrections authority. There was much controversy surrounding the siting of a new corrections facility. On of the proposed sites was in the neighboring locality not far from the town limits. Opponents of the corrections facility project were contending that the treated wastewater from the facility's wastewater treatment plant would increase pollution of the neighboring waterway. This is the same waterway that the town's wastewater treatment plant discharges into. There was also an effort underway to encourage the area localities to participate in the development of a regional airport.

As noted above, the town manager runs the day to day operation. He is an employee of the town and takes direction directly from council. He also develops issues to be put on the agenda for council meetings. In that role he is in position to control the flow of information to council. He also interprets issues for the council which often doesn't have the detailed knowledge or background to deal with more technical issues directly. This is done by summarizing the relevant concepts for issues under deliberation. He also apprises them of background information that would affect their decision. For complex issues he

develops detailed briefing papers that translate those issues into language the council members can understand.

Another job of the town manager is to interpret and then implement policies enacted by town council. In this position he is often the lightening rod for citizen complaints about council policy.

Between the town manager and council influence flows in both directions. Council enacts policy that influences his position as the town's operating officer. He, in turn, will try to influence council to enact policy that from his perspective are in the best interest of the town or make his job easier. These are often conflicting requirements.

The town manager was a strong proponent of the project and provided information for the study. He was also a vocal supporter of the project in meetings with officials from other localities. In the briefing papers he produced for council and his dialog at council meeting he aggressively supported the project.

Inputs and Outputs of the Deliberations

Initial Input

The deliberations in this study would ultimately result in a decision whether or not the Watertown should join a regional agency to provide wastewater

collection and treatment. Decisions of this type are very complex and usually involve technical issues. The town manager felt that it was his task to interpret the issues for council and fully brief them before any public deliberations took place. It was no secret that he himself was in favor of the initiative and would try it influence council to decide to participate in the regional agency.

As with most major public works decisions, the chief source on information was an engineering feasibility study report. The study, which looked at operational and financial aspects of setting up a regional wastewater agency for the town and the neighboring localities, determined that it was feasible to set up such an agency provided that enough localities would participate to make the agency financially viable.

The report was made available in either its full version or in an executive summary. The town manager decided how many of each version to request and who to distribute them to. Full versions of the report were on display in the town office for both council members and citizens who wanted to refer to them

The town manager developed detailed briefing papers from the information contained in the report. The briefing papers were distributed to all council members and made available to the public and the local newspaper They contained a detailed comparison of the current town wastewater operation and the proposed regional agency. An important point was that given the expected

level of participation by other localities the overall cost of wastewater collection and treatment for the town was shown to decrease.

Some council members commented about the briefing papers during interviews following the decision. They felt that the amount and character of information that they receive from the town manager in briefing papers and other documents is unique to their town. They rely on the briefing papers to be able to absorb complex issues without being overwhelmed. Some council members like the town manager to include information on the key players on issues in the briefing papers.

To better inform council, the town manager set up a series of private meetings between council members and the project manager. The meetings could only be held with two council members at a time to comply with the provisions of the freedom of information act. The town manager did not attend these meetings The purpose of the meetings was to brief the council members and to allow them to ask questions that they might be reluctant to ask in public. Discussion took place between the council members and the project manager and between the council members themselves. In later discussions both the council members and the town manager felt that these meetings were very helpful in clarifying some of the more complex issues.

Individual council member had other sources of information. They were all invited to and some attended a dinner meeting of the regional planning authority which included a presentation on the project followed by a question and answer period. The council members who attended were able to listen to questions that were asked by officials from other localities and hear what issues they considered important to their deliberations. Those council members also got the chance to ask questions of upper management officials of the proposed regional agency to get a feel for the type of people they might be dealing with in the future. One council person commented in a later interview that she was impressed with the quality of the regional agencies upper management.

There are council members who are also members of regional planning boards and other agencies. These members could interface with council and board members from other localities deliberating on the same issues and exchange views.

Council members note that for decisions such as these they must rely on expert opinion, either from the town manager or from outsiders, to help them clarify the technical issues. They realize, however, that these experts are oftentimes not unbiased providers of information.

Intermediate Outputs and Inputs

Deliberation of the issues also generated new questions and requests for clarification. These questions could be considered an intermediate output of the deliberation. The deliberation tended to focus on a few critical issues so that the questions generated were specific requiring specific answers. Since the issues being deliberated were technical the questions asked usually required the town manager to explain the issue or give examples of how the issue impacts the town on a daily basis. At times the town manager would have to defer to an outside expert for the answer to explain specific details.

Intermediate question sometimes have another purpose. Individual council members can use them to bring a issue that they think is not getting enough attention into prominence. A question of this type leads to follow up questions by other council members on the same issue which can change the direction of the of the entire deliberation. A council member asked a question in open session about the possibility of the town having a veto on the actions of the regional agency. This opened up a totally new line if discussion which had o do with the town loosing control of its destiny and involved not only the council members but also the town manager, the regional agencies project manager and some citizens. This technique is especially effective if a council member wants to "stir up the pot" by using a particularly emotional issue

Final Output

There were three possible forms of output from these council deliberations They could vote in favor of the motion that was under discussion. In this case the motion was to direct the mayor to send a letter to the regional agency that committed the town to participation in the regional wastewater operation if the regional agency determined that the project was technically and financially viable. They could have voted against the motion which would in effect send a signal to the regional agency that the town was not interested in pursuing the matter any further. Or, they could have voted table the motion for further discussion at and possible reconsideration at another time.

Any of the above outputs would require a majority vote of council. In this town the mayor only votes if a tie break is required . Since the vote was five to one in favor of the motion to send the letter of commitment the mayor's vote was not required.

Environment Boundaries

There is no explicit evidence in the in the case study data to suggest where the boundary is between the council and its environment. However. some initial boundaries be assumed based or the town's organizational structure The town council is the central core of town government. The town manager is an employee of the town and takes direction from council and also influences the council. That puts him in what is referred to being in sociotechnical systems

terms as being in the "transactional" environment The transactional environment is defined as being outside the system but both influencing and influenced by the system. Groups such as the town's citizens, outside experts and the media would be considered in the "contextual" environment because they influence the council but are not directly influenced by it. Of course, in reality everything the council does affects the entire environment to some extent such that it can be argued that there is no contextual environment, only a transactional environment. However, for the purposes of study we assume that both exist because it makes it easier to categorize the actions of individuals. Individuals can move from either environment and back based on the affects of their actions.

Tools and Techniques

The tools and techniques used by the town council to transform input information into an output decision reside largely in the structure of council itself and the rules under which it conducts business. Much of the structure is prescribed by the state code and whatever internal rules that the council has set up to conduct business.

Meeting Agenda

The town manager begins the process by setting the agenda for the council meeting. He gets input from the mayor and other council members on issues that they would like to discuss and act on at the council meetings. He also has

items of his own to bring up regarding town business and policies. The town manager has a great deal of influence as to the order in which topics are deliberated. In this case the choice of which meetings in which to discuss the regional wastewater topics and the timing of the public comment periods had much to do with the course of deliberations.

Conduct of Meetings

The town manager opens the discussion on each agenda topic with a brief statement of his position and what action, if any, he recommends the council take on the item. Except in rare cases the town manager has a specific recommendation that he would like council to follow. His comments, therefor, cannot be considered to be neutral. His comments probably have a greater affect on those council members that are not well briefed on the issues either because they haven't taken the time to read the briefing materials provided of because they have no interest in the topic. In this case the council members were well briefed on the topic and knew what the town managers position was His opening comments had very little affect on the deliberations that followed

The mayor, chair of the council, has some control of the flow of the discussion This control is limited, however, by the rules and procedures. Any council member can use the rules of procedure to affect the flow of discussion and the conduct of business.

Citizen Participation

The town council can get public input through the use of public hearings and public comment periods during council meetings. The town council is legally bound to hold public hearings on certain types of issues. Issues concerning taxes or land use are probably the most common. The rules for the conduct of public hearings are specific and are spelled out in detail in the [state code] for each topic. The mayor formally opens and closes public hearings and can then entertain motions to take action on the issues.

A public comment period is an informal forum to receive public input. It can be open and closed by the mayor at any time and there are no legal requirements that all citizens present be heard. There is also no requirement that the council take action after the public comment session is closed.

The town council in this instance chose to take citizen input in the form of public comment periods although there was no legal requirement to do so The town manager with input from the mayor chose to have two public comment periods during successive council meetings. At the first meeting the topic was on the agenda following a contentious issues involving certain business license fees All of the citizens who attended to speak to the license fee issue left the meeting before the regional wastewater issue came up. That public comment session was used for internal deliberation on the issues and clarification of some of the

issues by the town manager and the regional agencies project manager. Had the order of the agenda been reversed there may have been stray comments on the regional wastewater issue from citizens who were waiting to speak on the license fee issue. After the public comment period on the regional wastewater topic was closed the council would have moved on to the next agenda item without deliberating the wastewater issue at the meeting.

For the second council meeting the agenda listed a public comment period on the topic followed by a recommendation by the town manager to act on a letter committing the town to participation in the regional wastewater agency. There were no contentious issues scheduled prior to the topic so very few citizens attended and only two remained to comment on the topic once the mayor opened the public comment session. Without formal structure the public comment period became virtually a debate between the two citizens who were opposed to the issue, a council member who was also opposed and the town manager.

Restrictions on Meetings

Regulations such as the Freedom of Information act restrict the way that council members can meet to deliberate on issues. They are designed to ensure that the public has complete access to the governmental process. The act requires that no more than two council members can meet without advertising the

meeting in advance and taking minutes. This also applies to council "work sessions" where the members meet to discuss issues informally.

Council has the authority adjourn a meeting to go into private or "executive" session to discussion of certain issues but subject to restrictions. Executive sessions are usually reserved for issues surrounding active or pending legal action, real estate procurement issues or personnel matters where the public right to know might conflict with an individuals right to privacy as defined by the Privacy Act. The mayor must disclose publicly the items that to be discussed in the executive session. Following the executive session the mayor must certify that only those items previously disclosed were discussed. Official action on items discussed in executive session must be taken during public session

Issues

Providing public services is one of the most important and probably the largest governmental function. It is one of the most complex topic that town councils deal with. In cases where the public services involve utilities many of the issues are technical and difficult for some council members to understand. Because they impact the citizens directly the issues that are deliberated tend to become emotionally charged. Several major issues that came to light during Watertown's deliberations on the topic of whether or not to turn over the operation and maintenance of the town's wastewater facilities to a regional

agency. Many of these issues are technical and some of them are emotionally charged.

Autonomy and Control

The sovereignty issue came up in many forms throughout the deliberations. There were several sub issues deliberated that all dealt with the concern of some council members and citizens who perceive that joining a regional agency would cause the town to loose some of its sovereignty.

This was the theme of the issues brought up by one particular council member The council member brought up the issue that the town needed veto power over the actions of the regional agency. It was discussed at length both privately and in public meetings. The basis of their argument was that the town, being a relatively small community, would have little or no say in actions taken by the agency that would adversely affect the town. The agency, for example could build or expand wastewater treatment facilities either within, by virtue of its power of eminent domain, or just outside the town limits thereby hurting property values in town despite the town's objections. Another result of the town not having a veto would be that the agency could increase the capacity of the existing treatment system and further pollute the nearby waterway without seeking town approval. In effect the council member was arguing that by joining a regional agency the town would be giving up the ability to control its own destiny.

A counter to these arguments is that all of the localities would be granted the veto power. Another locality participating in the regional agency could veto projects that would benefit the town. In fact, given the technical constraints of providing wastewater service on a regional basis that would be a more likely scenario.

The mayor commented in an interview that the autonomy or control issue comes up frequently in one form or another. He thinks that it's an emotional reaction that emerges whenever the town talks about giving up some of its power or authority. Similar arguments were used against a regional solid waste agency proposal and the siting of the regional corrections facility.

Loss of a Financial Asset

Part of the proposal was that in joining the regional agency the town would transfer ownership of the wastewater facility, along with all of inherent liabilities, to the regional agency. A common argument against this was that the wastewater facilities are assumed to be financial assets, the loss of which would reduce the value of the town and hence its borrowing power. Some argued that if the town transferred ownership then it should be paid for the facilities

The other side of this issue is that the wastewater facilities themselves are not really an asset to the town but the service they provide is. It makes no

difference who owns the wastewater facilities. The town's borrowing power is based on revenue generating potential which comes from the taxable property in town, not the property town government owns which is not taxable.

The town's wastewater service customers have been paying for the facilities through their sewer rates. If a regional agency were to reimburse the town for those facilities they would have to charge the same customers for the cost of the reimbursement. In effect the customers would be paying for the facilities twice.

The Impact of Out of Town Customers

Several years ago a number of housing developments were built just outside the town limits. At their request the town extended water service but not wastewater service into those areas. Since that time these out of town customers have been paying a higher rate for water than the in town customers. The higher rates were justified by noting that the in town customers have paid the majority of the capital cost to construct the water system. It was only fair that the out of town customers pay to reimburse the town for he capital cost of the portion of the facilities that serves them.

The town manager argued that in time there would be political pressure on the town to also provide wastewater service in those areas. He contended that the pressure would come from business owners in town, who are influential, but reside outside of town. Based on his own experience he felt that the town's

existing wastewater treatment plant would not have the capacity to handle both the needs of the town and those of out of town customers. The issue, as he saw it, was that the town could either try to bear the political pressure of denying wastewater service to the out of town customers, some of whom already have failing on site wastewater disposal systems, or it could join a regional agency that could build a larger capacity wastewater system in another locality that could handle both the in town and the out of town customers.

The other side of the argument is that a regional agency would find it easier to attempt an expansion of the existing wastewater treatment facilities which would increase the pollution in the nearby waterway and lower property values in town. By using its power of eminent domain, the agency could do this without town approval.

Environmental Issues

Environmental issues were mentioned as a concern by several of the council members during private discussions but did not figure prominently in the public deliberations. Pollution of the nearby waterway was an issue that was argued both ways. Some council members were concerned that having a regional agency handle the wastewater and increase treatment capacity would lead to more development and along with it an increase in the pollution of the nearby waterway. Others saw the regional agency as being able to serve areas that

now have existing, and possibly failing, on site disposal systems which reduce the pollution in the nearby waterway.

Encroaching Development and Urbanization

A citizen was concerned that if the town joined a regional agency, it would make centralized wastewater service available in the all of the surrounding area. That would encourage uncontrolled development in all of the neighboring localities and ruin the rural nature of the region. The town's decision to join the regional agency would be the first step in destroying an attractive way of life. Some citizens feel that the towns autonomy is their only defense against creeping urbanization which threatens the small town, rural, atmosphere that the value

Cost of Service

The feasibility study determined the cost to the customers of the town if they joined the regional agency. The town manager produced a detailed comparison of the existing town wastewater service rates and the proposed regional agency rates. It showed that there would be savings to the town's customers if the town participated in the regional agency. So for most of the council members rates were not an issue. Moreover, since rates or taxes tend to be issues that elicit response from the citizens, their lack of participation in the deliberations signals the fact that, in this case rates, did not become an important issue generally However, one council member was of the opinion that the regional agency

should guarantee in writing, that the rates would not increase in the future He was joined on this issue by a prominent citizen.

Facilities Management

Only one council member commented about the issue that the town may be better off with a regional agency operating the wastewater facilities that specializes in the field. The member felt that a specialized agency would be better able to meet the demands of future regulatory requirements. This sentiment was shared by the town manager.

Regionalism

Regionalism as an issue can be described as cooperation among localities on projects that provide mutual benefit. It has been used in this case to describe participation among localities to provide needed services at lower overall cost through centralization and more efficient use of resources. The town manager would like to see the town participate in a regional agency to take advantage of larger economies of scale in providing wastewater services. In order for the regional agency to be formed there must be a minimum number of participating localities. This would ensure sufficient customer base so that the agency would be financially viable.

There have been previous regional initiatives. The localities each have different opinions on whether their experiences have been good or bad. There is a

regional solid waste agency that has been in operation for some time. In general opinions are that it has served the region well. The regional correction authority also has a long history. Lately, however, its attempts to find a suitable location for a new correctional facility has caused friction among the localities Everyone knows that the new facility is necessary and that they will benefit but no one want it built in their locality.

The regionalism issue also conflicts with the autonomy and control issue. Being a part of a regional agency means that a locality must give up some control of the services the agency provides to gain the benefits.

Deliberations

Forums

The deliberations on issues took place in different forums. Some of these forums were private discussions between individuals while others were in public meetings. Issues that were deliberated extensively in private discussion with a few exception tended not to be deliberated in the public forums.

Autonomy and Control

The autonomy and control issue was put forward by one council member deliberated in both public and private forums. It was deliberated among the council members and discussed among council members and the town manager

in private sessions. It was also deliberated extensively in public among the same groups. There is evidence that council members discussed this issue with citizens in private. Citizens openly joined in the discussion in the public sessions.

Despite the extensive deliberation only one council member was convinced that the autonomy and control issue was serious enough to oppose the decision to join the regional agency. One of the council members noted in an interview following the decision that the council member and the citizens who pushed the autonomy and control issue were of the same political ideology.

Encroaching Development and Urbanization.

This issue was not deliberated as extensively in private as the autonomy and control issue. There is evidence that two council members did discuss it in private. It was, however, deliberated extensively in public among the same groups as the autonomy and control issue. The deliberations were between those who's first concern was protecting the town's future and those who saw the town's action as a threat to the whole region. The fate of this issues was also similar to the autonomy and control issue in that only one council member saw this issue as a reason to oppose the decision to join the regional agency

Regionalism

The regionalism issue was not deliberated by itself. It came up in deliberations on other issues such as the autonomy and control and encroaching development and urbanization.

Out of Town Water Customers

The issue of the out of town water customers encompassed many sub issues However during deliberations the discussion revolved around the affect that providing them with wastewater service would have on the existing town system The issue was deliberated in public session among he council members and between the council members and the town manager. The town manager contended that if the town provided the out of town customers with wastewater service it would use up all of the available reserve capacity leaving the town with no capacity for development. This would force the town into expanding the facilities and incurring a significant amount of debt which would make the rates extremely high. Some of the council members were of the opinion that the town had an ethical obligation to extend wastewater service to the out of town customers which have been provided water service.

Facility Operations

The issue of improved facility operation under a regional agency was not deliberated in public. There were private discussions among the council

members and between council members and the town manager concerning this issue.

In general most council members accepted the town manager's opinion that the proposed regional agency would have a greater level of expertise in the operation and maintenance of wastewater facilities. Therefor the deliberation moved to whether or not the town could satisfactorily operate and maintain the facilities. Some council members maintained that since it was currently operating the facilities it could continue to do so. The town manager's opinion was that it could but not indefinitely. He noted that the town had just spent a great deal of money to rehabilitate the facilities after some years of neglect The town manager is afraid that given the changing political conditions and priorities the facilities could fall into disrepair again 5to the point where they would no longer be reliable.

Environmental Issues

Environmental issues did not play a large part in the deliberations and were not deliberated in public. They were mainly used in discussions to reinforce points on other issues. Control over the pollution level in the nearby waterway was given as one of the points in the autonomy and control issue That the town would loose control over what goes into the waterway and the environment would deteriorate. All of the council members agreed that they didn't want to see the waterway receive any more pollution. Therefor the issue became

whether the best way to protect the waterway was to keep the wastewater facilites in town hands or the join the regional agency. One council member framed the issue in a larger perspective by saying that if the entire area didn't accept some kind of centralized wastewater management the eventually all of the waterways would be polluted.

Loss of a Financial Asset

This issue was deliberated in private in the early stages. It never came up in the public deliberations. Most council members did not see it as a major issue.

Decision Process

Although not strictly an issue, there was some discussion in the public sessions on the decision process itself. Upon seeing that the deliberations were probably going to result in a decision in favor of the joining the regional agency. one council member made a motion that the decision be put to a vote of the entire town by referendum. This motion failed for lack of a second.

Decision

Following the second public comment period a motion was made that the mayor send a letter which would commit the town to participating in a regional wastewater agency if such an agency was determined to be viable. The motion was seconded and was followed by a vote. The vote was five to one in favor

Confusion in Deliberations

There was evidence of confusion in many of the issues that were deliberated. Efforts to resolve the confusion usually involved question directed to either the town manager or to the regional agencies project manager. The mayor or council members often asked for detailed explanations to clarify some of the more complex issues. Since many of these issues were explained during private discussions not all of the council members had the benefits of these clarifications.

An example of an issue that caused confusion was rates and costs. One of the problems was that the current rates paid by the customer and the rate estimates developed in the study report were not directly comparable. They were based on different minimum charges. They were also confusing in that the town's existing rate structure was developed around a combined water and wastewater operation whereas the regional agency would be dealing strictly with wastewater. The town manager attempted to clarify this issue in his briefing papers and was partially successful in eliminating some of the confusion. However, we later agreed that it was best to compare the overall cost of the town's wastewater operation as listed in the town budget with the town's portion of the overall regional agency's operational cost estimates. This reduced the issue to one of comparing two numbers.

There was also some confusion with the connection fee concept. The regional agency was proposing a two part connection fee. One part would strictly cover the actual cost of making the connection. Customers who were already connected to the town's wastewater system would not have to pay this charge The other part of the fee is a charge to cover part of the capital cost of providing the wastewater facilities. Not only would the existing town wastewater customer be exempt from this fee but also new customers who are connecting to the system and abandoning onsite disposal systems. This concept had to be explained many times during the deliberations.

The mayor noted, in an interview following the decision, that these were all complex issues for council members. Some of them do not have the technical or financial background to understand these types of issues. Therefor, they would each tend to focus on the issues that they could readily understand. Many time these would be the issues that were more political or emotional The deliberations would get bogged down on the emotional issues and neglect the more relevant technical and financial issues.

There was some confusion in discussion between council members and the town manager. An example of this was a discussion between the town manager and a council member regarding the capacity of the town's existing wastewater system. The town manager was discussing the capacity issue in terms of the

affect the out of town customers would have on the system. At the same time the council member was approaching the issue from the standpoint of where an expansion to the wastewater treatment plant would be built. There was no progress during the discussion because they were actually discussing different issues.

On the other hand one council member said that there wasn't much confusion during the deliberations. He had indicated in private discussions early on that he was solidly in favor of joining the regional agency. The evidence shows that he didn't participate to any great extent in the public deliberations. Since his mind was made up early any confusion during the deliberations was irrelevant

Roles in Deliberation

The evidence shows that no real champion emerged from among the council members. Most of them looked to the town manager to lead them through the deliberations. He is also in a unique position to influence the outcome of deliberations. In his role as the interpreter of complex issues he can emphasize certain points which will affect how council members perceive an issue. In public deliberations he usually gives an opening briefing on issues that can set the tone of subsequent discussions. Many time during the course of deliberations he is asked to provide clarification on issues. The result is that much of the dialog during deliberations is in the form of questions and responses between

the town manager and council members. In public sessions citizens will often engage in discussions with him rather than directly with council members.

In this case the town manager was a vocal proponent of the proposal to participate in the regional agency. He was involved extensively during the study phase and contributed information that was used in drafting the report. He produced detailed briefing papers and distributed them to council members to explain the issues that he thought were relevant.

One council member played a dominant role in the deliberation of the issues and sub issues surrounding autonomy and control. His first issue was the loss of a financial asset and although other council members were aware of the issue it was never deliberated in public. The issue was deliberated in private discussion between him and the town manager. According to other council members he prefers to deliberate issues in private discussions. He may disagree on issues but it doesn't seem to affect his personal relationships with the other council members.

His second was the veto issue. He argued that the town needed a veto against action of the regional agency. He kept this issue prominent throughout the deliberations involving not only the council members and town manager in the discussion but citizens and the regional agency project manager as well He also supported citizens in a discussion over the issue that the town should be

guaranteed that the regional agency would not raise the rates or expand the existing wastewater treatment plant.

The council member was very vocal on these issues during public deliberations. Another council member commented that often time he will actively discuss issues because he "loves the game" rather than because of the merits of the issue. This sometimes disturbs other council members who taking those particular issues seriously.

Paradoxically, there were comments that he is often very reluctant to speak during public deliberations often enlisting other council members to make comments for him.

He and some of the citizens who participated in the deliberations are of a similar political ideology that distrustful of "big government". He cast the sole dissenting vote on the decision. After the vote he was visibly upset and seemed to take it as a personal defeat.

Another council member sees herself as representing the senior citizens in town The issues that she was vocal on were mainly those concerning the rates which could impact citizens on a fixed income. She was in favor from the beginning and made some comments on the issue of putting the decision to a referendum She noted that there wasn't much citizen participation at any of the public forums

where these issues were discussed and doubted that there would be much voter participation on a referendum.

A council member who has a small business in town was said to abstain on most controversial decisions because he doesn't want to anger potential customers. He was supportive of the decision in private discussions. He wasn't vocal during the public deliberations but voted in favor.

The mayor was in favor from the beginning. He was involved is discussions with both the town manager and the regional agency project manager during the study phase of the project.

In his role as chair of the public sessions he would stop discussion and ask for clarification on issues if he thought deliberations were bogging down At one point he commented that he was disappointed that some of the people speaking on the issues weren't better prepared.

Most council members apparently made their own decisions based on the report. the town managers briefing papers and private discussions. They didn't participate much in the public deliberations. I fact they didn't seem to be affected by the public deliberations.

Although she couldn't speak for others one council member described how she has prepared for deliberations on issues such as these. She reads the briefing papers that the town manager develops very carefully and then asks him questions to clarify issues. She will also discuss issues with other council members privately. She that she is usually fully briefed on the issues before they go to public deliberation. She said that she lets everyone know her position up front.

APPENDIX 2

RIVERVIEW CASE STUDY
REVIEW DRAFT

The following is the draft version of the Riverview case study narrative that was given to selected officials of Riverview for their review and comment It contains typographical errors, inaccuracies and omissions that were subsequently corrected following the review process. The corrected version is included as Chapter VI.

Riverview, a Case Study

Introduction

The purpose of this study was to investigate the decision process used by one small locality in dealing with complex issues. It focuses on how the technical decisions are made in the political environment by looking at the steps in the process, the key players and what factors affected the outcome

This study should lead to a clearer understanding of what can be done early in the process to improve the transformation of information into a decision In the case of engineering studies, how can they be performed such that they lend themselves more easily to a political decision process.

The data was analyzed using a sociotechnical systems framework. This framework breaks the analysis down into three distinct phases; an environment scan, an analysis of the technical aspects of the process, and an analysis of the social aspects of the process. A sociotechnical system transforms inputs

(materials) into outputs (products) through a process. In the case of a town council the input is information, the process is deliberation and the output is decisions or policies

The environmental scan attempts to describe the environment or conditions within which the council operates. It is concerned with two levels of influence. The transactional environment includes the town staff and any other entities that not only influence the council but are also influenced by it (two way influence) The contextual environment includes generally those who influence council but are not directly influenced by it (one way influence).

The environment also includes the inputs and outputs to the decision process which in this case are considered to be information provided to council and the final decision that it makes on the issue. There may also be intermediate inputs and outputs consisting of questions and responses to clarify issues

The technical analysis focuses on the tools and techniques used by council reach a decision, along with the issues themselves and the deliberations that took place.

In the case of a town council the structure of the council itself and the rules under which it conducts business are the tools and techniques it uses to come to a decision. Information flow and the deliberations are largely controlled by the

rules of order, the Freedom of Information Act and other rules covering the conduct of official business. The action of the town manager in summarizing information and setting the agenda may also be considered tools used by the council in deliberations.

Issues are the central focus of deliberations. In any decision process the issues may exist (standing issues such as taxes or autonomy) or they may come from input information and are specific to a particular decision. Input information is applied to issues to determine how they will be affected by a decision Each council must deliberate a specific set of issues to transform information into decisions or policies. Issues are often the result of influence from the environment.

Deliberations are the process of applying input information to issues to transform it into decisions. Intermediate outputs in the form of questions may require supplemental information to complete the deliberation. Deliberations on various issues may take place concurrently or in sequence The output from the individual deliberation form the input for the final decision Deliberations can take place in a variety of forums and may include interactions with the environment.

The social analysis is used to determine the roles of the various participants in the process. It looks at the deliberations to determine how the participants

interact to help move the deliberations along. It identifies participants who took the lead in deliberation the different issues. A determination can be made of which issues are important to each participant.

The Riverview Environment

Riverview is an incorporated community of approximately three thousand population. It is situated in a relatively rural area of [southeastern United States]. It is a town which means that it is part of a larger county. The town and the county share some services. Residents of the town are citizens of both the town and the county. They are represented at the county level by a member on the county board of supervisors. They also pay taxes to both the county and the town.

Riverview is governed at the local level in the town manager form of government It consists of a town council with members elected at large for 2 year terms The mayor is directly elected to act as chair of the council, votes only in tie break situations and does not have veto power. The council employs a town manager or executive to act as secretary of the council and manage the day to day activities of the town.

Regular meetings of the council are held on a monthly basis usually in the evening of the last Monday of every month. The agenda for the meeting is drafted by the town manager and distributed to the council members in advance

along with other background information. The meetings are run using a standard form of parliamentary procedure. Typically motions require a second which then opens discussion on the issues surrounding the motion. A motion and a vote are required to then close discussion and put the original motion to a vote (call the question). The town has the authority to adopt supplemental the rules of order. This town, among others, has adopted a rule that the mayor may only vote on a motion if his vote will result in a tie break. The practical implication of this rule is that the mayor rarely votes on any motion.

As with other elected bodies in [the state], the Riverview town council is subject to the Freedom of Information Act. The ensures public scrutiny of actions by council. It prescribes that meetings of council, with some exceptions, must be open to the public. A meeting of more than two council members is considered an official act of the council and must therefore be advertised in advance and open to the public. The council can, however, discuss personnel or legal matters in private, often called executive session, provided that the topic is announced in public in advance. No votes can be taken during the executive session. The mayor must subsequently certify in public session that only those topics disclosed before the executive session were discussed. Any council action that is taken on items discussed in executive session must take place in public session.

Discussions with council members revealed some of the political and social background of this particular council. In my discussions with council members political party labels were never mentioned. In recent elections on of the most vocal council members was defeated. Just before the election he was an outspoken critic of a rather large capital project that the town was planning.

In general the council members have a great deal of concern about how the citizens will react to their decisions. This may be the reaction to the activities in a neighboring locality whose governing board is pressing forward with a large capital project. The members of its governing board seem to fully support the project but there is a great deal of dissent among the citizens. The governing board is receiving criticism in the local newspapers.

There is some influence form the neighboring localities. The town manager interfaces with his counterparts from other localities at regularly scheduled meetings to discuss regional topics. The town is involved in an effort to develop a small airport it owns into a regional facility. The regional airport would become a significant revenue source for the town.

There are several members of the county board of supervisors who are influential in town. They made it clear that their position was in favor of having both the county and the town part of the regional wastewater authority

The town manager is an employee of the town and takes direction directly from council. He also develops issues to be put on the agenda for council meetings. In that role he is in position to influence council by controlling the flow of information. The council relies on him to interpret complex or technical issue that they may not have the expertise to understand. concepts for issues under deliberation. He also apprises them of relevant background information that would affect their decision.

It became clear by the town manager's actions that he was not in favor of having the town participate in a regional wastewater agency although he never overtly stated that position.

Another job of the town manager is to interpret and then implement policies enacted by town council. In this position he is often the lightning rod for citizen complaints about council policy.

Between the town manager and council influence flows in both directions. Council enacts policy that influences his position as the town's operating officer He, in turn, will try to influence council to enact policy that from his perspective are in the best interest of the town or make his job easier. These are often conflicting requirements.

The town manager was a strong proponent of the project and provided information for the study. He was also a vocal supporter of the project in meetings with officials from other localities. In the briefing papers he produced for council and his dialog at council meeting he aggressively supported the project.

Inputs and Outputs of the Deliberations

Initial Input

The deliberations in this study would ultimately result in a decision whether or not Riverville should join a regional agency to provide wastewater collection and treatment. Decisions of this type are very complex and usually involve technical issues. As with most major public works decisions, the chief source on information was an engineering feasibility study report. The study, which looked at operational and financial aspects of setting up a regional wastewater agency for the town and the neighboring localities, determined that it was feasible to set up such an agency provided that enough localities would participate to make the agency financially viable.

The report was made available in either its full version or in an executive summary. The town manager decided how many of each version to request and who to distribute them to. Full versions of the report were on display in the town office for both council members and citizens who wanted to refer to them

The town manager did not perform a detailed interpretation of the information in the report. He developed a comparison or the financial information in the report with the town budget for wastewater operations.

The regional agency's project manager was asked to give a presentation on the topic at a work session of town council. The town manager was present to explain the issues from the town's perspective.

The regional agencies project manager suggested that he be allowed to meet with the council members in private to let them ask questions and have some of the issues clarified. The town manager said that he would rather have him meet only with a committee of the council that deals with public works topics The meeting was never set up.

The mayor and two of the council members along with the town manager attended a dinner meeting of the regional planning agency which included a presentation on the concept of forming a regional wastewater agency The council members who attended were able to listen to questions that were asked by officials from other localities and hear what issues they considered important to their deliberations. Those council members also got the chance to ask questions of upper management officials of the proposed regional agency to get a feel for the type of people they might be dealing with in the future

There are council members who are also members of regional planning boards and other agencies. These members could interface with council and board members from other localities deliberating on the same issues and exchange views.

Council members note that for decisions such as these they must rely on expert opinion, either from the town manager or from outsiders, to help them clarify the technical issues. They realize, however, that these experts are oftentimes not unbiased providers of information.

Intermediate Outputs and Inputs

Many of the town council members asked questions at various times to clarify issues they were deliberating. Some of the questions were directed to the regional agency's project manager while others were directed to the town manager. The town manager introduced issues that were not within the scope of the original report. Many of them dealt with intangibles and called for subjective judgments. It was not possible to resolve some of these issues with the information that was available.

During the process the mayor realized that the town manager may not have been providing the council with objective information. He began to ask the

regional agency's project manager directly for information to provide some balanced input.

Final Output

The meeting where the final deliberations took place and a vote taken was a scheduled to be regularly council meeting. However, other issues on the agenda caused the meting to run long so council decided to adjourn and reconvene to discuss the topic at a luncheon session. Discussion of the issues took place in executive session so no direct evidence of those deliberations is available. The council reconvened into public session to vote on a motion

There were two possible forms of output from these council deliberations given the form of the motion under discussion. They could vote in favor of the motion which was to stop any further consideration of participating in the regional wastewater agency. That would send a signal to the regional agency that the town was not interested in pursuing the matter any further. Or, they could vote against the motion and continue consideration after possibly receiving more information. The motion passed on a vote of 3 to 2 of the council members present. The vote did not involve a tie there for the mayor did not vote on the motion.

Environment Boundaries

There is no explicit evidence in the in the case study data to suggest where the boundary is between the council and its environment. However, some initial boundaries c be assumed based or the town's organizational structure. The town council is the central core of town government. The town manager is an employee of the town and takes direction from council and also influences the council. That puts him in what is referred to being in sociotechnical systems terms as being in the "transactional" environment The transactional environment is defined as being outside the system but both influencing and influenced by the system. Groups such as the town's citizens, outside experts and the media would be considered in the "contextual" environment because they influence the council but are not directly influenced by it. Of course, in reality everything the council does affects the entire environment to some extent such that it can be argued that there is no contextual environment, only a transactional environment. However, for the purposes of study we assume that both exist because it makes it easier to categorize the actions of individuals Individuals can move from either environment and back based on the affects of their actions.

An indication of the actual boundaries is evident from the roles of some of the participants and from the activities. Roles that shifted during the deliberations would also indicate a shift in the boundaries. In the beginning the mayor was content to let the town manager control the flow of information. The regional

agency's project manager was asked to provide information to the council through the town manager. At that point the project manager was in the contextual environment.

Later on the mayor began to approach the project manager directly for information and requesting him to put the information into different formats. Then it could be argued that the project manager was moved into the transactional environment.

When the council deals with issues in executive session the boundaries are pulled in tight and everyone except the town manager is relegated to the contextual environment.

Tools and Techniques

The tools and techniques used by the town council to transform input information into an output decision reside largely in the structure of council itself and the rules under which it conducts business. Much of the structure is prescribed by the [state code] and whatever internal rules that the council has set up to conduct business.

Meeting Agenda

The town manager begins the process by setting the agenda for the council meeting. He gets input from the mayor and other council members on issues that they would like to discuss and act on at the council meetings. He also has

items of his own to bring up regarding town business and policies. The town manager has a great deal of influence as to the order in which topics are deliberated. In this case the choice of which meetings in which to discuss the regional wastewater topics and the timing of the public comment periods had much to do with the course of deliberations.

Conduct of Meetings

The town manager opens the discussion on each agenda topic with a brief statement of his position and what action, if any, he recommends the council take on the item. Except in rare cases the town manager has a specific recommendation that he would like council to follow. His comments, therefor, cannot be considered to be neutral. His comments probably have a greater affect on those council members that are not well briefed on the issues either because they haven't taken the time to read the briefing materials provided of because they have no interest in the topic. In this case the town managers comments were extremely influential because of councils general lack of knowledge on the subject.

The mayor, chair of the council, has some control of the flow of the discussion This control is limited, however, by the rules and procedures. Any council member can use the rules of procedure to affect the flow of discussion and the conduct of business.

This particular council prefers to deal with complex topics in dedicated work sessions. The sessions are required to be public but are not well attended by the citizens. The local paper doesn't seem to cover them either. These work sessions are held during the day such that sometimes council member can't attend them because they conflict with job schedules.

This council conducts some deliberations in executive sessions. The rules are specific on how executive sessions are to be conducted and what can be discussed during them. The council classified this as a real-estate issues so that it could legally be discussed in executive session.

The town council does have standing committees to deal with specific subjects such as public works topics. A committee consisting of only two council members can meet in private without violating the Freedom of Information Act Early in the deliberations the town manager suggested that this topic could be deliberated by them to develop a recommendation for action by the full council However, this never took place.

Citizen Participation

The town council can get public input through the use of public hearings and public comment periods during council meetings. The town council is legally bound to hold public hearings on certain types of issues Issues concerning

taxes or land use are probably the most common. The rules for the conduct of public hearings are specific and are spelled out in detail in the [state code] for each topic. The mayor formally opens and closes public hearings and can then entertain motions to take action on the issues.

A public comment period is an informal forum to receive public input. It can be open and closed by the mayor at any time and there are no legal requirements that all citizens present be heard. There is also no requirement that the council take action after the public comment session is closed.

This council did not choose to schedule any special forum to receive citizen input on this topic.

Restrictions on Meetings

Regulations such as the Freedom of Information act restrict the way that council members can meet to deliberate on issues. They are designed to ensure that the public has complete access to the governmental process. The act requires that no more than two council members can meet without advertising the meeting in advance and taking minutes. This also applies to council "work sessions" where the members meet to discuss issues informally

Council has the authority adjourn a meeting to go into private or "executive" session to discussion of certain issues but subject to restrictions. Executive

sessions are usually reserved for issues surrounding active or pending legal action, real estate procurement issues or personnel matters where the public right to know might conflict with an individuals right to privacy as defined by the Privacy Act. The mayor must disclose publicly the items that to be discussed in the executive session. Following the executive session the mayor must certify that only those items previously disclosed were discussed. Official action on items discussed in executive session must be taken during public session

Issues

Providing public services is one of the most important and probably the largest governmental function. It is one of the most complex topic that town councils deal with. In cases where the public services involve utilities many of the issues are technical and difficult for some council members to understand. Because they impact the citizens directly the issues that are deliberated tend to become emotionally charged. Several major issues that came to light during Riverville's deliberations on the topic of whether or not to turn over the operation and maintenance of the town's wastewater facilities to a regional agency. Many of these issues are technical and some of them are emotionally charged. Not all of them, however, were actually deliberated before the decision vote was taken

Cost of Service

The cost of service to the customers of Riverville was a major issue for the town council. Much of the public deliberation revolved around the cost or rates issue

The council members felt that they would have a difficult time justifying their decision to the citizens if it resulted in the rates increasing. They were adamant that their decision could not result in a rate increase.

Loss of "Windfall Revenue"

The town has a contract to treat an industrial waste that is generated in another locality. This contract results in a large amount of revenue to that is used by the town to supplement tax revenues. The town has been able to use these funds to support additional projects with out having to resort to a tax increase. This issue was important because of its impact on the town's overall financial status

Annexation Potential

Some council members were concerned about how the decision would affect the town's ability to annex more land from the surrounding county Typically, a town will offer to provide utilities and other services to areas that it wants to annex in order to entice the residents in those areas to vote in favor of annexation If the wastewater facilities were owned and operated by a regional agency the town would not have those utilities to offer.

Involvement in a Regional Enterprise

There were council members who were concerned about how the town would fair with a regional agency providing a utility service. The town was already involved with a regional solid waste agency but only to the extent that it participated in the

establishment of a regional disposal site in another locality. They thought that the town would paying for more than its share of operating costs and subsidizing the wastewater facility operations that the regional agency would operate in other localities.

The other side of this issue is that by joining a regional agency the town can take advantage of the growth of the other localities. In increase in the number of customers that the regional agency serves would spread the agency's fixed costs over a larger base and reduce the rates in all of participating localities.

Loss of an Asset

If the town joined the regional agency it would be required to transfer ownership of the wastewater facilities to the agency. Many on town council feel that the facilities are an asset and that the town have made an investment to build them. They are afraid that if the facilities were transferred to another agency free of charge the town would be losing its investment.

Some feel that because of regulatory requirements on the performance of the facilities that carry significant penalties the facilities are actually a liability for the town. They would be glad to let another agency take the responsibility for their operation and maintenance.

Facility Operation

One council member expressed a concern that if the facilities were operated by a regional agency there would not be anyone living close by to respond to emergencies during off hours. The regional agencies plan would be to monitor the facilities during off hours using remote sensing technology and computers that could alert operating personnel to potential problems. Some council members were not comfortable with reliance on automation to aid facility operation and monitor performance.

Town Management

An issue for some was the need for the town to maintain an individual in the town manager's position with the expertise to manage the wastewater facilities They felt that if the current town manager decided to leave the town would be able to hire a new town manager at a lower salary if he didn't need those qualifications.

Deliberations

Although deliberations may have taken place in different forums, data was only available for deliberations in public forums. Of the seven issues identified only six of them were deliberated in public forums were data was being collected There is very little data available from deliberations in private forums

Cost of Service

The cost of service issue was deliberated in public forums. The rates and costs shown in the report were higher than what the town manager calculated using the town's budget. Council members voice concern that they couldn't justify deciding on an option that would cause the amount that the town's customers pay to increase. This also lead to a comment that it looked to them that the regional agency proposal was probably more appropriate for smaller localities where the cost of service by the regional agency would be lower than what they are paying now. The issue could not be resolved between only the town and the regional agency because any changes in how the regional agency costs were calculated affected all of the localities in the area who were considering the same decision. Timing as it was the rate and cost issue could not be resolved before the council voted on the decision.

Loss of "Windfall Revenue"

The town was receiving a large amount of revenue from the treatment of the industrial waste. They deliberated what would happen if the town lost the revenue. They discussed if the town could make up the revenue some other way. The regional agency project manager told the mayor in a private discussion that there was only a limited number of ways that the agency could legally handle the industrial waste. He was told that the regional agency could only charge the industrial customer for the actual cost to treat the waste and that the revenue had to go back into the operating budget This would result in

significantly less revenue than the town had been receiving. Since the funds would go into the regional agency's operating account they would not be available for the town to use. This is another issue that could not be resolved satisfactorily in the time available before the vote.

Involvement in a Regional Enterprise

During deliberations some of the council members noted that there were differences between the town and the other localities that would be participating in the regional agency. The other localities are developing because they have land available. The town is almost fully developed. This means that while the other localities will have need to expand their existing wastewater facilities or build new ones, the town's existing facilities should be sufficient for the foreseeable future. There was concern that if the town transferred its facilities to the regional agency that agency may use the facilities to treat additional wastewater from outside of town. The town had invested in an expansion to assure that it would have adequate capacity. They were afraid that the capacity would be used up to benefit other localities and not the town

The regional agency's project manager assured them that it was the agencies policy to always provide capacity in excess of all locality needs He noted that in the report there were future costs included to pay for an expansion of the town's wastewater facilities to replace the capacity used up by another locality

One of the council members asked why the regional planning agency was supporting the concept. The town manager replied that it was because the other localities needed wastewater service. He noted that the town started its wastewater facilities while it was still inexpensive. Now it is to expensive for a small localities to each build there own facilities independently.

Although not resolved to everyone's satisfaction, this issue was not a major factor in the decision.

Facility Operations

One of the council members noted that future regulatory requirements for the wastewater facilities is uncertain. If the government puts tighter restrictions on the facility performance the town may be forced to upgrade it at considerable cost. The project manager replied that no mater who owned the treatment facilities the customers of Riverview would have to pay for part if not all of the cost of the improvements.

The same council member was concerned about the capacity of the treatment facilities. The town manager replied that the treatment facility in not yet at capacity and is meeting all of its performance requirements. The council member said that was true now but there was no way of knowing what future requirements would be.

These issue was also not resolved during deliberation but it didn't become a deciding issue either.

Another council member was concerned about the regional agency's plan to use automation and remote monitoring to operate the facilities. The project manager explained that the automation would be used to hold down costs by making the most efficient use of manpower. The town manager said that the town could also use automation but chose not to so that the facility operators would be forced to observe the facility performance first hand. The council member said that he wasn't comfortable with automation because of past experience at a local industry.

Loss of an Asset

The issue of the regional agency reimbursing the town for the wastewater facilities was deliberated just before the vote. Data on this deliberation came from the minutes of that meeting. A council member asked why the report didn't mention that the town would be reimbursed for the assets. He noted that the town has made substantial investments in those facilities There was no mention in the minutes if that issue was resolved but given the timing it probably wasn't

Another council member asked if the regional agency was going to make a profit It showed that some of he council members did not understand that the regional

agency would be a governmental body. The town manager, who was familiar with the structure of the regional agency apparently did not respond to clarify the issue.

Deliberation Process

In a later interview a council member mentioned that he thought the deliberations stayed within council. Only the town manager influenced them There was no outside influence.

Confusion in Deliberations

The deliberations were hampered by confusion in the issues. The most serious of which, and the one that lead to the decision that probably lead the council to make the decision it did, was confusion over the rates and costs The rates that were estimated in the report and the rates the town customers were currently paying were not directly comparable. There were a number of reasons for the confusion. The rates in the report and the towns rates were based on different "average" household usage. The report was based on an Average value accepted by the federal funding agencies. The town rates used a higher average usage value that was developed empirically. Also, rates in the report included all overhead functions whereas the town pays for much of the overhead function out of tax revenues not the wastewater service rates

One council member later said the it would have been helpful if the report figures and the towns figures had been shown in the same format. Other council members said that they had limited accounting skills and could have used help analyzing the financial information.

Before the last deliberation the mayor showed the project manager a briefing paper that the town manager distributed to the council members. There were many inaccuracies that could have been attributed to miscommunication between the project manager and the town manager. The project manager attempted to correct the inaccuracies but unfortunately the mayor was the only one to have the corrected information before the last deliberation and the decision.

The mayor later said that in deliberations where the project manager wasn't present there were many issues left unresolved due to lack of information. Some of these issues could have been clarified by the project manager if he were present. The mayor noted that is was probably a mistake not to have him there.

A council member noted many of them are uncomfortable discussing complex issues in public. It appears that private briefing sessions with small groups of council members may have been beneficial.

The mayor said that given the confusion that remained on the important issues and the wording of the motion they had to vote on the council made a correct decision.

Roles in Deliberations

The evidence shows that there was no individual to champion the topic during deliberations. There were, however, council members who were vocal on specific issues.

The mayor was involved in deliberations on rates and costs. He realized that the cost would probably be the deciding issue. He spent a great deal of effort to get the cost issues clarified. Another council members was also trying to get clarification on the cost issues.

The issue concerning the town loosing an asset in the wastewater facilities seemed to involve the most council members.

Only two council members were concerned with the town's future needs and how the decision would affect them. That same council member was also concerned about how the town would be affected by decisions in the neighboring localities The council member was present at the dinner meeting of the regional planning agency.

The data shows that only one council member was concerned about the loss of the windfall revenue but there must have been others.

APPENDIX 3

REPRESENTATIVE COMMENTS FROM WATERTOWN CASE REVIEWS

"Throughout this paper is a reoccurring theme, which is "the influence of the town administrator on the decision process." Because of the technical aspects of the process Council has to rely on the administrator to provide the necessary info. Admittedly the administrator has great influence, but the information given is of greater value than how biased it is. It is up to the council members to evaluate the info and make their own decision."

"The other side of the argument is that a regional agency could not succeed at doing what the community would never do!"

"in Keeping with his Policy that the individual Council members should be provided with the facts of the project and not otherwise influenced by himself."

APPENDIX 4

REPRESENTATIVE COMMENTS FROM RIVERVIEW CASE REVIEWS

"I'm Not Sure about this - I thought that [town manager] was present at Town Council Meetings because he was also town clerk. He does not take Minutes though [T.C.] used to and Now [V.C.] does."

"I Find this paragraph to be confusing because on page 6 you state that it was clear that the town Manager was not in Favor oF the town participating in a regional wastewater agency. Is that the project in the paragraph below and if so why is the town Manager spoken of as a proponent and supporter in this paragraph? This appears to be condradiction."

Jim,

Most of my comments are related to grammer, sentance construction etc rather than content. I couldn't help it, I quess it is the writer in me surfacing When you print this For the Final time take a look at tenses - you seem to wander back form past to present to Future, sometimes within one sentence

I don't know how helpful my comments will be but, I did read is & put some time into it.

[T]

APPENDIX 5

INTERVIEW GUIDE

Interview Questions for Town Council Members

Who did you discuss the project with ?

What issues were discussed during the conversation ?

What issues did you discuss with fellow council members ?

What issues did you discuss with people outside of council ?

Were there sources of information other than the report that influenced the deliberations ?

How did your thinking about the _____ issue change during the course of the deliberations ?

How much influence do you think outside information had on the other council members ?

Were there any leaders that emerged during the discussion ?

In the end, which issues lead to you making your decision ?

What issues or information lead to confusion ?

What additional information would have helped to clarify the issues ?

Where there private discussions held outside of council ?

Were the deliberations on this issue typical of others you have been involved with ?

How is the public involved in these types of issues ?

APPENDIX 6

DATA SOURCE CODE

WATERTOWN TOWN COUNCIL SESSION	(M) T1GS (D)
RIVERVIEW TOWN COUNCIL SESSION	(M) T2GS (D)
PUBLIC INFORMATION MEETING	(M) T1PM (D)
PLANNING AGENCY DINNER MEETING	(M) PDDM (D)
WATERTOWN TOWN MANAGER	(M) T1M (D)
WATERTOWN TOWN COUNCIL MEMBER	(M) T1C(I) (D)
RIVERVIEW TOWN COUNCIL MEMBER	(M) T2C(I) (D)
WATERTOWN MAYOR	(M) T1C(I) (D)
RIVERVIEW MAYOR	(M) T2C(I) (D)

(M) - RECORDING MEDIA
A - AUDIO TAPE
M - MEETING MINUTES
PN - PROJECT NOTES

(I) - LAST INITIAL OF NAME

(D) - DATE

APPENDIX 7

EXAMPLE DATA BASE PAGE

Riverview Case Study Data Base — Deliberations

	Evidence Item	Data Source Code
9.	The deliberations were held in "executive session". After reconvening T2CH made a motion " for the town not to get involved with ____" seconded by T2CG2. T2M said that if the motion was approved he would put a letter in the record that council should at least allow additional review of the issue later on. T2CG concurred.	MT2CGS 8/26
10.	T2CS was concerned that the report doesn't provide for compensation to the town for the "assets" and the investment under taken by the town.	MT2CGS 8/26
11.	T2CP questioned what the profit states of ____ was.	MT2CGS 8/26
12.	The motion noted under item # 9 was voted on and passed 4-2.	MT2CGS 8/26
13.	T2M said that given the information that T2M presented to council and how it was presented T2C made the proper decision although he didn't agree with some of the information and how it was presented.	AT2M POST
14.	The issues that were deliberated included the cost and the perceived loss of control.	AT2M POST
15.	T2M says that the town should give up the responsibility and liability of the wastewater system such that it can hire a replacement T2A that doesn't need that expertise.	AT2M POST
16.	T2M said that he had some discussions with T2CH before the meeting. He wasn't aware, however, of what issues would be discussed during the vote meeting.	AT2M POST
17.	T2M said that if the regional group had been able to meet and negotiated some give and take to bring the cost to the town closer to their existing cost before T2C met to vote it may have succeeded.	AT2M POST

APPENDIX 8

IMPLICATIONS FOR ENGINEERING PRACTICE

Implications for Engineering Practice

Engineers, whether in private practice or as public employees, are sometimes involved in proposing a project or program to an elected body for approval. General practice has been to provide information to the elected body in the form of a feasibility study or engineering report. The information then progresses through the decision process. Although the engineers are available to answer questions, they are generally not considered to be involved in the decision process beyond providing technical information.

In the past the topics and issues elected bodies considered were relatively uncomplicated, and elected officials, with a fair amount of life experience, could understand most of the issues. They could deliberate issues to resolution and confidently make a decision. This is no longer the case The elected officials have the same amount of life experience but the topics and issues they must consider have become more complex and potentially conflicting.

The role of engineers is changing. While before they were the providers of technical information, now they must also direct that information through the decision process. The goal is not necessarily to have every project or program automatically approved. Rather, the goal is to have the elected body make a decision, based on the merits of the topic, as to whether or not it is in the best interest of the locality.

The cases revealed a number of actions that engineers can take, in concert with locality staff and officials, to help the elected officials resolve issues and move the decision process forward. An unresolved issue is one for which there is not a consensus among the elected officials as to whether or not it is favorable or unfavorable.

Citizen involvement should be taken into account early in the process. If possible, the history of previous topics, should be reviewed to gauge how different types of issues affected the level of citizen involvement and what are potential "hot button" issues. This information could then be used to frame the topic either to encourage or discourage citizen involvement.

Frame the topics and issues in a way that will cause the least political problems for the elected officials but still lead to a proper evaluation of the proposal. That is, a decision that is reached on the merits of the topic being decided, instead of unrelated issues.

In determining issues that could find their way into deliberation, the project manager should take into account other topics in the environment that could be linked to the proposal. The project manager should plan to provide information that would tend to keep the topics separated.

Town councils rely on town managers as their primary source of credible information. Town managers will frame the input of information to suit their view of the topic. What this means for a project manager is that without the town manager's support it is difficult to move an issue through the decision process

successfully. The town manager must buy into the proposal early and preferably have input into the proposal's development.

When developing proposals it is important to understand the locality's view of itself to better predict the issues that will be used in the decision process and the locality's response to those issues.

A person within the system should be identified to act as a topic leader or champion. The person should preferably be part of, or close to, the group that will actually make the decision. The person should also be knowledgeable about the community environment. The person should have enough knowledge in the topic area to be able to interpret the input information for the elected officials and should know enough about the history of past decisions to be able to predict what issues will arise in the deliberations during the decision process This person needs to be accessible to the elected body members throughout the entire decision process to provide intermediate input that is necessary to clarify major issues on the spot. If the issues cannot be clarified right away, then the decision process should be suspended until sufficient information is available to resolve them. The process should not be allowed to move to completion with any of the major issues unresolved.

It is important to identify as many of the technical and non-technical issues early in the process. Many issues may be resolved by addressing them in the input information. If not, then they should be addressed early enough so that the project manager and topic champion can determine the intermediate input information to provide to resolve the issues.

It is best to deal with emotional issues in private sessions with the elected officials. They will feel more comfortable asking questions and discussing emotional issues without public scrutiny. This does not mean that the issue should necessarily be resolved in private, but the elected officials should be briefed in private, so when they get involved in a public deliberation they have command of the issues.

Deliberations must continue until all of the important issues are resolved for there to be a decision on the merits of a proposal.

APPENDIX 9

VITA

VITA

James C. Pyne was born in East Hampton, Connecticut on December 9, 1954. His educational background includes a B.S. degree in Civil Engineering from Virginia Polytechnic Institute and State University, Blacksburg, VA (1978) and an M.E.A. degree in Engineering Administration from George Washington University, Washington, DC (1987). Upon completion of his undergraduate studies he held the position of Plant Manager at various facilities for a large metropolitan public utility until April 1987. He then was promoted to Chief of Design and kept this position until March 1995 when he was assigned to the position of Special Projects Manager for the utility.